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Editor *Michael Huxley*
Executive Editor *Selwyn Powell*
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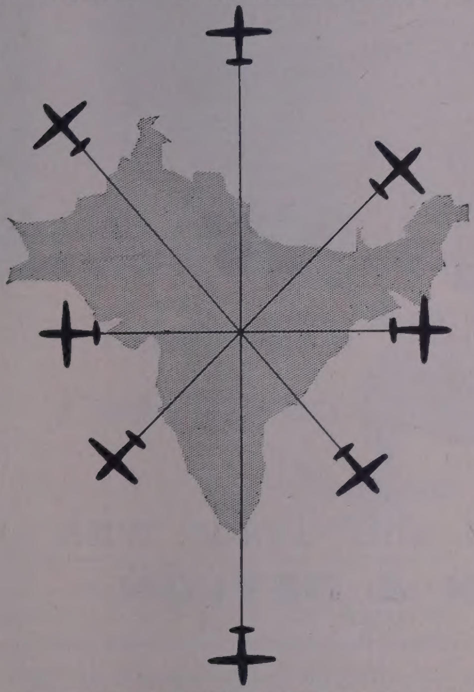

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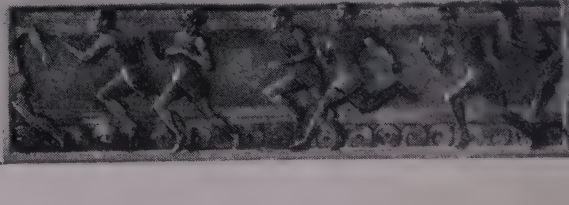

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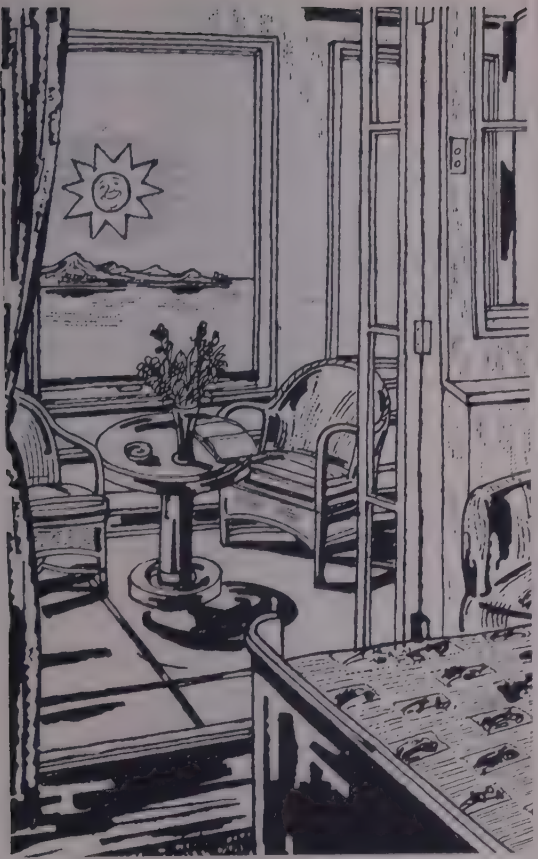

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SIR LEONARD PATON on DEVELOPMENTS IN MALAYA AND SINGAPORE

Sir Eric Miller

During the course of his circulated address prior to the 49th Annual General Meeting of Harrisons & Crosfield, Ltd., held in London on December 9, 1957, Sir Leonard Paton, who has succeeded Sir Eric Miller as chairman, made the following comments on Malaya and Singapore.

THE year has been dominated by negotiations culminating in the Federation of Malaya becoming a sovereign independent State within the Commonwealth. That the new constitution should have been achieved so smoothly, and even with the strengthening of traditional friendships, is due substantially to the wisdom of Malayan leaders with Tungku Abdul Rahman at their head, and to the tact and initiative of the Colonial Office team, led by Mr. Lennox-Boyd.

Discussions with Singapore are continuing with a view to finding a suitable formula whereby the political aspirations of that territory, so different in so many respects from Malaya may also be achieved.

Malaya's prosperity must continue for many years to be based on the production of primary commodities. The demand for land is considerable, and it is to be hoped that Government will feel able to make releases with reasonable speed from undeveloped areas so that genuine needs can be met and the present practice of purchasing existing Estates for fragmentation and resale at high prices can be checked.

Our interests and responsibilities in Malaya extend to upwards of 200,000 acres, the contribution from which to the economy includes many millions of dollars paid annually in wages, capital expenditure, and taxation. We have long had deep roots in Malaya, and try to be in the forefront of every move to advance the interests of the country and the people.

Contrast this with the activities of the take-over speculators, who, in the main, have no stake in the country and no knowledge of planting or local conditions. Their object is to make a quick profit, and to obtain control of the cash resources which have been carefully built up over the years by the Plantation Companies they take over. Instead of being utilized for further development of productive capacity these resources are then as a rule diverted to quite other purposes and lost to Malaya. It is not overstating the problem to say that this movement, if allowed to continue, could bring in its train unemployment, fragmentation, and mis-management of Estates, and even communal strife, the very results at which the Communists aimed but without success.

[*He announced that Sir Eric Miller had been appointed Life President.*]

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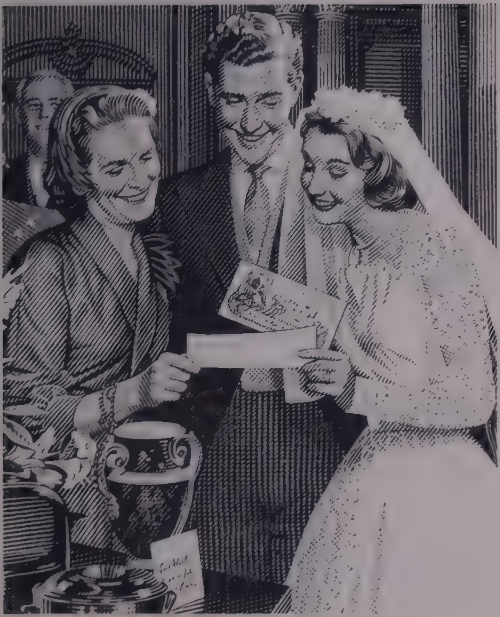

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The Military Geography of the Welsh Marches

by GENERAL SIR JAMES MARSHALL-CORNWALL, K.C.B., etc.

We are privileged to make available to a wider public the following abridgement of a lecture first delivered by the President of the Royal Geographical Society to its Fellows on December 3, 1956

"In no branch of study is geography a more indispensable aid than in military history. Military geography is, therefore, an important branch of the science, and should receive its due share of attention in a geographical magazine." Those words were written 84 years ago by a former President of the Royal Geographical Society, Sir Clements Markham, and they are as true today as then. I make no apology, therefore, for renewing my distinguished predecessor's plea for the study of military geography, and no more fitting terrain could be found for such a study than the rugged landscape of the Welsh Marches.

Let us first of all take a glance at the geomorphology of the Principality of Wales, for the physical features of a region depend fundamentally on the geological structure underlying its surface. Wales may be considered geologically as a tilted platform of the older bedded rocks, with the dip sloping downwards from north-west to south-east: from the pre-Cambrian igneous rocks of Anglesey, through the hard schists and conglomerates of the older Cambrian beds that have been weathered into the crags and pinnacles of Snowdonia, to the more recently laid-down sedimentary strata, including the carboniferous pocket of the South Wales coalfield and the Old Red Sandstone of the Hereford basin.

The earlier beds of rock were subjected at the end of the Silurian period to intense folding movements, which corrugated the strata into ridges and furrows; and the ridges, accentuated by erosion, form a series of bastions projecting north-eastward and dominating the eastern lowlands: the Berwyn, the Long Mynd, Radnor Forest and the Black Mountains of Monmouthshire. In historic times they had great military importance by forming strongholds and observation-posts, flanking the river-valleys.

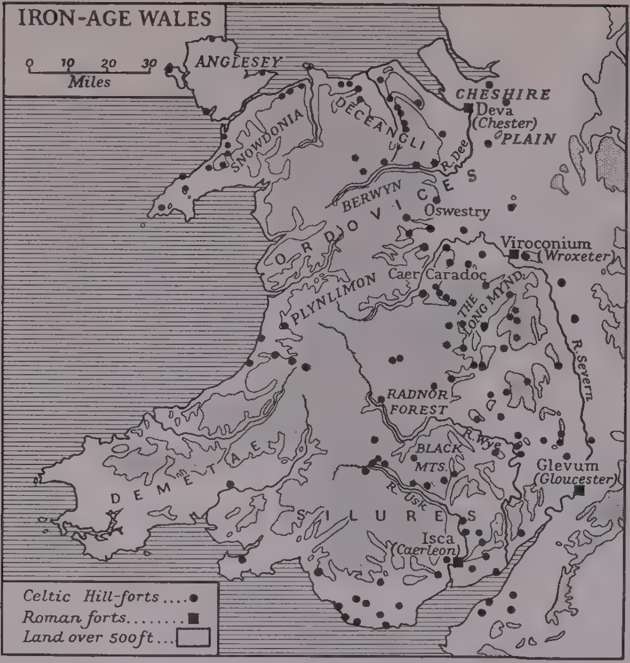
But, from the military point of view, by far the most important geographical feature is the river-system which has furrowed this massif of ancient rock in different directions. Four main rivers, rising in the Welsh highlands, carve their way down to the sea close to the English border; it is their valleys which, throughout history, have provided the strategic corridors for invading armies.

North Wales is cut in two by the River Dee, flowing from Lake Bala east and north through the Berwyn range and the Cheshire plain to Chester, in Roman times a seaport at the head of a wide estuary. In Central Wales the Severn and the Wye both rise on the eastern flank of the Plynlimon watershed and meander southward through the Welsh Marches into the Bristol Channel. In its upper reaches the Severn forms a corridor for penetration into the Welsh highlands; in its middle and lower course it presents a military obstacle covering their eastern frontier. In South Wales the much shorter River Usk affords a line of penetration northwards into the heart of the mountain massif.

So much for the geographical background; we can now see how it has moulded the military history of the Welsh borderland through some 1500 years. I will divide this history into five phases:

1. The Celtic Iron Age (200 B.C. to A.D. 75)
2. The Roman occupation (A.D. 75 to A.D. 400)
3. The Saxon menace (600 to 1066)
4. The Anglo-Norman Marcher Lords (1066 to 1276)
5. The Edwardian conquest (1276 to 1284)

Even the archaeologists cannot tell us who were the original inhabitants of Wales, or what language they spoke, so we need not go further back in history than 200 B.C. We know that the British Isles were then being overrun by Celtic tribes from the Continent, armed with iron weapons, who conquered and probably mixed with the Bronze Age inhabitants of the country. These Celtic Iron Age invaders, in successive waves, con-



K. C. Jordan

solidated their hold on the land by means of a system of hill-forts; and Welsh military history begins with them. The Iron Age hill-forts occupy commanding positions, generally dominating an approach up a river-valley, and consist of an enclosure of three or more acres, surrounded by a multiple wall and ditch, frequently hewn out of solid rock, evidence of iron tools.

The map shows the distribution of these hill-forts. Some were built guarding the river-valleys on the west coast, presumably against Irish raiders, but the bulk of them are concentrated on the approach-roads from the east, doubtless to meet the Roman invader. Only a few of these hill-forts have been properly excavated and we know little about them, but I have been struck by the fact that the ones on the eastern border of Wales are nearly all sited so as to be inter-visible in a continuous chain along the frontier, and doubtless there was a system of smoke-signals or fire-beacons for inter-communication.

Our next stage is the Roman conquest. Julius Caesar, of course, never penetrated so far as Wales when he made his two reconnaissance raids in 55 and 54 B.C. The Claudian invasion of A.D. 43, however, resulted in a permanent occupation of south-east Britain, which had been completely overrun by A.D. 48, and three out of the four legions were then moved up to the Severn frontier: the 14th Gemina and 20th Valeria Victrix to Viroconium (Wroxeter) on the middle Severn, and the 2nd Augusta to Glevum (Gloucester) on the lower Severn.

The Welsh borderland was at that time inhabited by three Celtic tribes, apparently independent of each other: in the extreme north the Deceangli of eastern Gwynedd, in the centre the Ordovices of Powis, and in the south the Silures of Gwent. Further south-west were the Demetae of Dyfed.

In A.D. 49 the Romans made their first invasion of Wales with an expedition against the Deceangli in the north, doubtless to acquire control of the important lead, silver and copper mines. An advance was made at the same time by the 2nd Legion, Augusta, from Gloucester against the Silures of the Usk valley. This tribe had been encouraged to resist the Roman advance by the famous Caratacus (Caradoc), the rightful prince of south-east Britain, who had fled westwards; Caradoc then moved north to rouse the Ordovices to revolt, but he was severely defeated in the year 51 by the legions converging from Wroxeter and Gloucester, probably in the middle Severn valley.

Trouble with the Brigantes on their northern frontier in Yorkshire then stopped the Roman advance into Wales, and the Silures in the south successfully counter-attacked. The Roman western frontier then stagnated on the Severn line for ten years, until in A.D. 59 another successful Roman advance was made in the north to Anglesey, to crush the Druids, who formed the core of the resistance movement.

The revolt of Boudicca (Boadicea) in East Anglia again, however, halted the Roman advance in 61 and no further westward progress was made until the arrival of a new and energetic Roman governor, Julius Frontinus, in 74. It appears to have been this brilliant military engineer who grasped the fact that Britain was an island and that the frontier legions were operating too far from their base in Kent, ten days' march away. He therefore created two new legionary fortresses: at Deva (Chester) in the north and at Isca (Caerleon) in the south, each at the head of a navigable estuary, and from these

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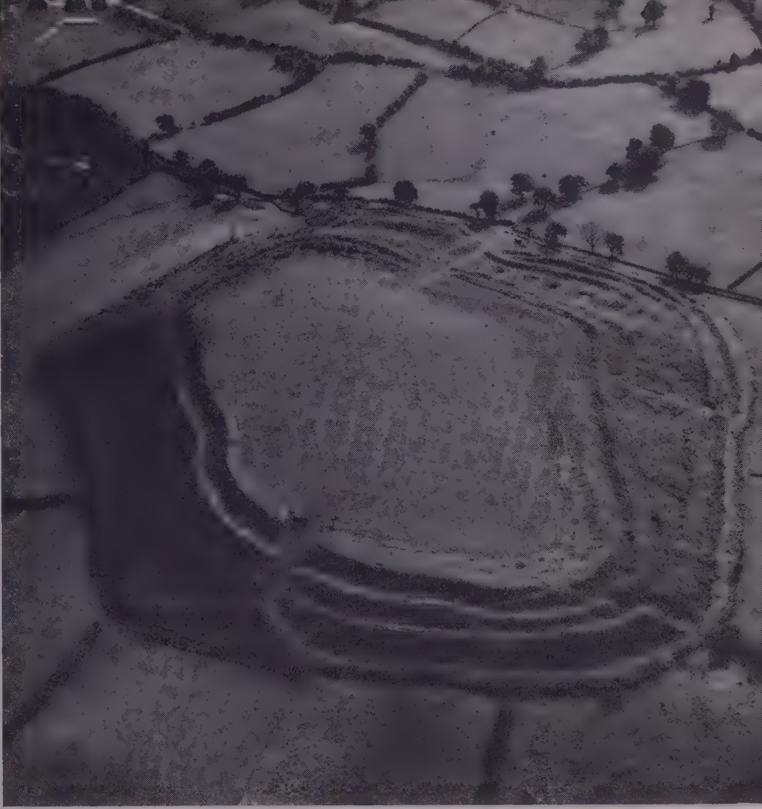
The military geography of Wales begins with the hill-forts built by the Celtic tribesmen who, armed with iron weapons, overran Britain about 200 B.C. The forts in which they defended themselves against earlier inhabitants and later invaders were constructed on hilltop contours, promontories or plateaux and enclose three or more acres. Most of them are sited to command strategic approaches up the river-valleys, but they are more suited to repel a raid than to withstand a siege, being rather inaccessibly placed above the 500-foot contour. (Right) *The fort at Oswestry is on that contour; it was fortified very strongly for border warfare.* (Below) *Caer Caradoc, dominating Stretton Dale, north of Ludlow, is an example of a hilltop fort. It may have been here that Caradoc (better known as Caratacus), who led the Britons against Claudius, suffered final defeat in A.D. 51 at the hands of the Roman legions*



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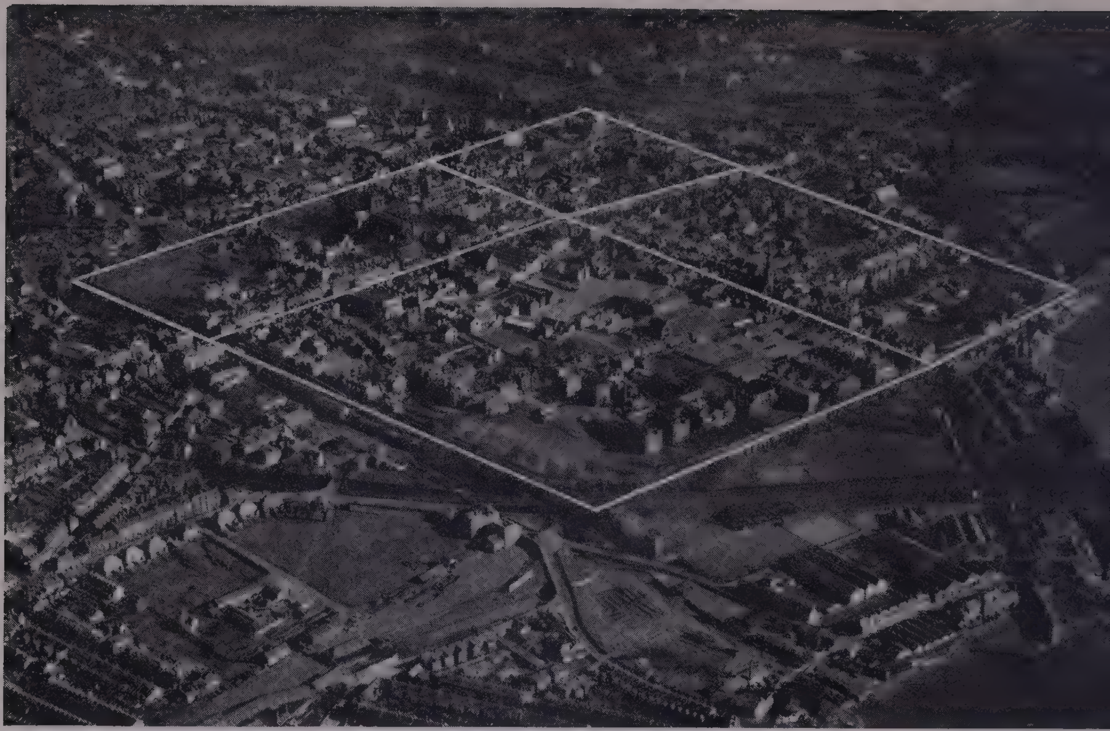
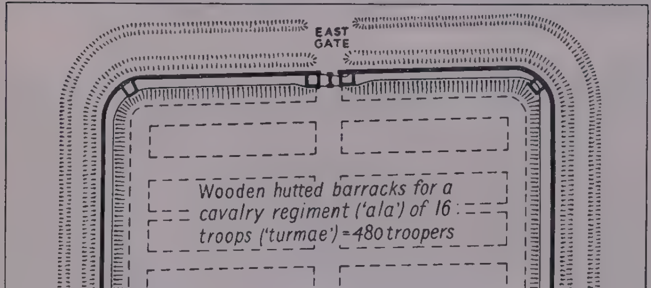
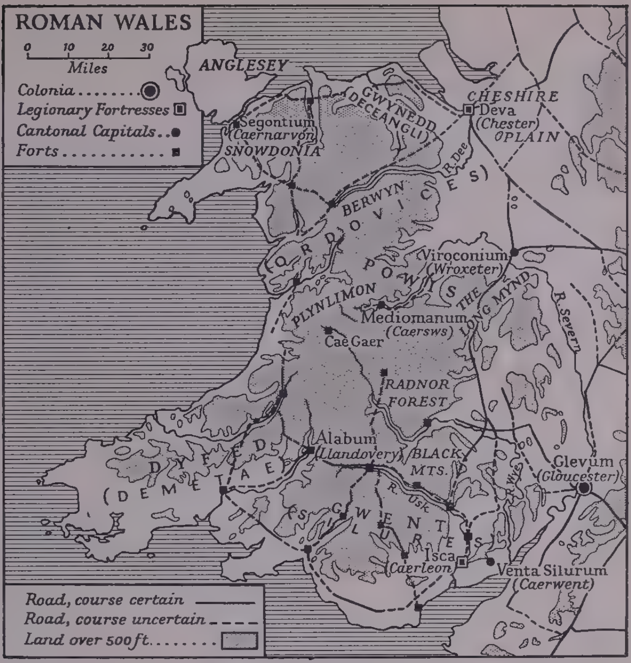


Aerofil


EAST GATE
Wooden hutted barracks for a cavalry regiment ('ala') of 16 troops ('turmae') = 480 troopers
GRANARY
HEADQUARTERS
C.O.'S HOUSE
Drain
Well
NORTH GATE
VIA PRINCIPALIS
Drain
SOUTH GATE
BATHS
Horse lines for 500 horses
WEST GATE
Feet
0
100
200

Julius Caesar's invasions of 55 and 54 B.C were hardly more than reconnaissance raid but that led by Claudius in A.D. 43 reache the Severn frontier in five years. Wels resistance was not overcome until A.D. 7 after Julius Frontinus had built two ba fortresses, each designed to accommodate legion, at Caerleon (*Isca*) *in the south an* (above) *Chester* (*Deva*) *in the north, th only city in England of which the walls o Roman foundations are still intact. Dev situated on the navigable tidal estuary o the Dee, could easily be supplied by th Roman fleet. It covered 59 acres and wa traversed by two intersecting main road Wales was brought into subjection by mean of a network of strategic roads leading fro the base fortresses. The roads mostl followed the river-valleys and near the the Romans built small forts or* castell (left) *about a day's march—15 to 2 miles—from each other. These, therefor unlike the Celtic hill-forts, were usuall on low ground with a good water-suppl and could withstand a long siege. The were mainly garrisoned by auxiliaries, i.e not Roman citizens like the legionarie*



K. C. Jordan

advanced bases, which could be supplied by the Roman fleet, active steps were taken to subjugate Wales. Frontinus defeated the Silures in 75, but the Ordovices still held out in Snowdonia. This pincer-movement strategy was continued by his celebrated successor Julius Agricola (father-in-law of Tacitus); a network of forts connected by military roads was constructed all over the country; and the conquest of North Wales was finally completed by the year 79. It took the Romans five years to conquer the whole of south-east Britain, but it took thirty years to subjugate Wales. The reason lies in geography.

We may now consider the different strategic conceptions of the Celtic tribesmen and the Roman legionaries, and how they were influenced by the local geography.

The Celtic tribesmen, primarily a pastoral community, lived in scattered villages, but, when danger threatened, they concentrated in hilltop forts surrounded by an earth bank (generally multiple) with a timber stockade and ditch or ditches, which could also accommodate some of their flocks and herds.

The Romans followed a very different form of strategy and their tactical methods were also different. Their object was permanent occupation of the country and, to effect this, they had to move troops rapidly from their main bases to suppress any local rising. A network of strategic roads leading from the base fortresses was thus essential. Each of the two mentioned above was organized for a garrison of a legion (6000 men). Caerleon was 49 acres in extent, Chester 59 acres, as at one time Chester had to house two legions. The plan was a rectangular earth bank with timber palisade and ditch, converted thirty years later into a stone-built fortress.

On these two base fortresses the strategic network of roads was built up. These roads, wherever possible, followed the river-valleys. Every fifteen or twenty miles (i.e. a day's march) a *castellum* or fort was constructed, with a garrison of 500 cavalry or 1000 infantry, mostly auxiliary troops, i.e. not Roman citizens like the legionaries. These *castella* were planned in miniature exactly like a legionary fortress, but only four to eight acres in size.

The siting of these intermediate forts was based on an entirely different conception from that of the Celtic hill-forts. The castellum was sited astride or quite close to a strategic road, and therefore in most cases on low ground. It was usually placed on a river bank, ensuring constant water-supply, and preferably commanding a good ford or bridge. Each castellum had a granary, so as to withstand several months' siege. By the end of the 1st century A.D. the military occupation of Wales was ensured by two base fortresses, twenty-four forts and 700 miles of strategic roads. Some of the forts, such as Caersws, Cae Gaer and Llandovery, were apparently sited to supervise mining operations. The occupation of Wales was undertaken not only to achieve military security and to cover the left flank during the advance northward into Scotland, but to exploit the mineral wealth of the country—copper, lead, gold and iron.

A study of the map shows us that, whereas most of the Celtic hill-forts were sited above the 500-foot contour, almost every Roman castellum is well below that level, their average altitude being 275 feet above the sea.

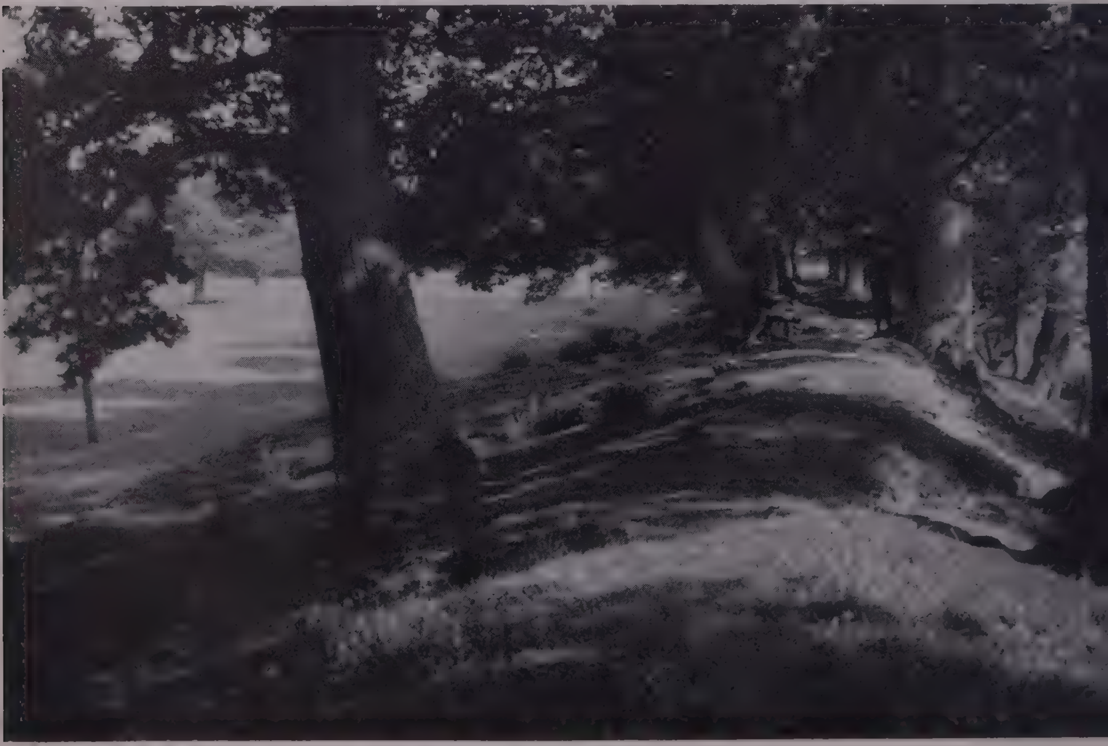
After the final withdrawal of the Roman legions, about the year 400, the Celtic tribes of the west were left to their own devices and reverted to their age-long tradition of inter-tribal warfare. While at times acknowledging the suzerainty of one overlord, the configuration of the country tended normally to split them into three independent principalities: Gwynedd, north of the Dee; Powis, holding the upper Severn and buttressed on the Kerry Hills and Clun Forest; Deheubarth, or Dynevor, covered by the Wye valley to the south coast. This corresponds in a remarkable way to the three main tribes encountered by the Romans—the Deceangli, the Ordovices and the Silures—and exemplifies the way in which, to quote Trevelyan, "History is governed by Geography".

Meanwhile, the southern and eastern parts of Britain, no longer shielded by the military power of Rome, were overrun by the Anglo-Saxon invasions and settlement. This permanent settlement began in the 4th century and went on steadily for more than 200 years until the beginning of the 7th century, when the Northumbrians reached the Dee and the West Saxons the Severn. The various Saxon kingdoms had, however, already started fighting for supremacy among themselves, and by the end of the 8th century the central kingdom of Mercia—the March-land—achieved that leadership under King Offa, with his capital at Tamworth. Offa was recognized by the Pope as "Rex Anglorum" and corresponded with the Emperor Charlemagne on equal terms. He was not only a good soldier, he was also a wise statesman; he realized that he could not hold down his Saxon rivals, Northumbria in the north and Wessex in the south, with a hostile Wales in the difficult hill-country on his western flank. About the year 784, therefore, Offa came to an agreement with the Welsh tribal princes to demarcate the western frontier of England by a continuous bank and ditch, running for 150 miles from the estuary of the Dee to the mouth of the Wye. This stupendous 8th-century earthwork is still visible for 80 miles of its length and is still known as "Offa's Dyke". It still marks more or less the border-line between England and Wales.

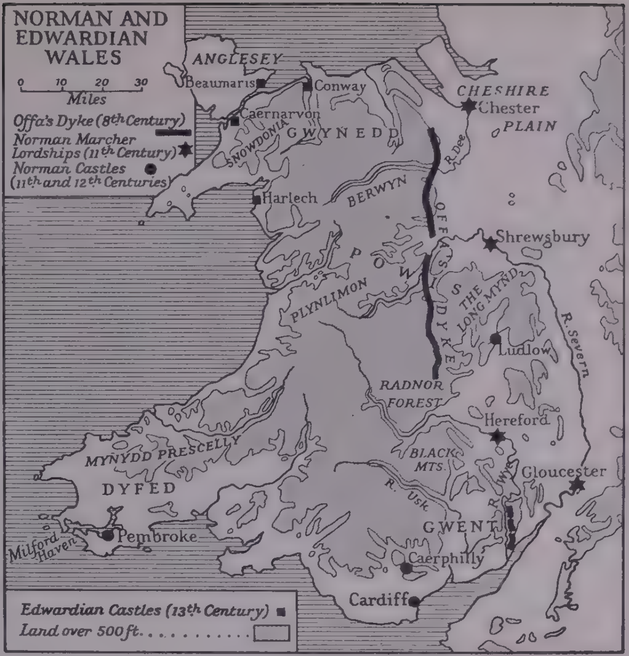
Offa's Dyke was a visible boundary rather than a linear fortification; it may have been inspired by Hadrian's Wall between the Tyne and Solway, but was not an imitation of it. To man it throughout its length would have required a vast army. It was actually

Offa's Dyke, a boundary rather than a fortified line, marked the Anglo-Welsh strategic frontier for nearly 300 years and is still visible for 80 miles, with a bank sometimes 15 feet high and 40 feet across. It was purely an earthwork: its 8th-century Saxon builders were not stone-masons

The author



sited in general to be defensible against the Welsh, with the ditch on the Welsh side, but in certain places it concedes the tactical advantage to the Welsh, so it was probably demarcated by mutual agreement.



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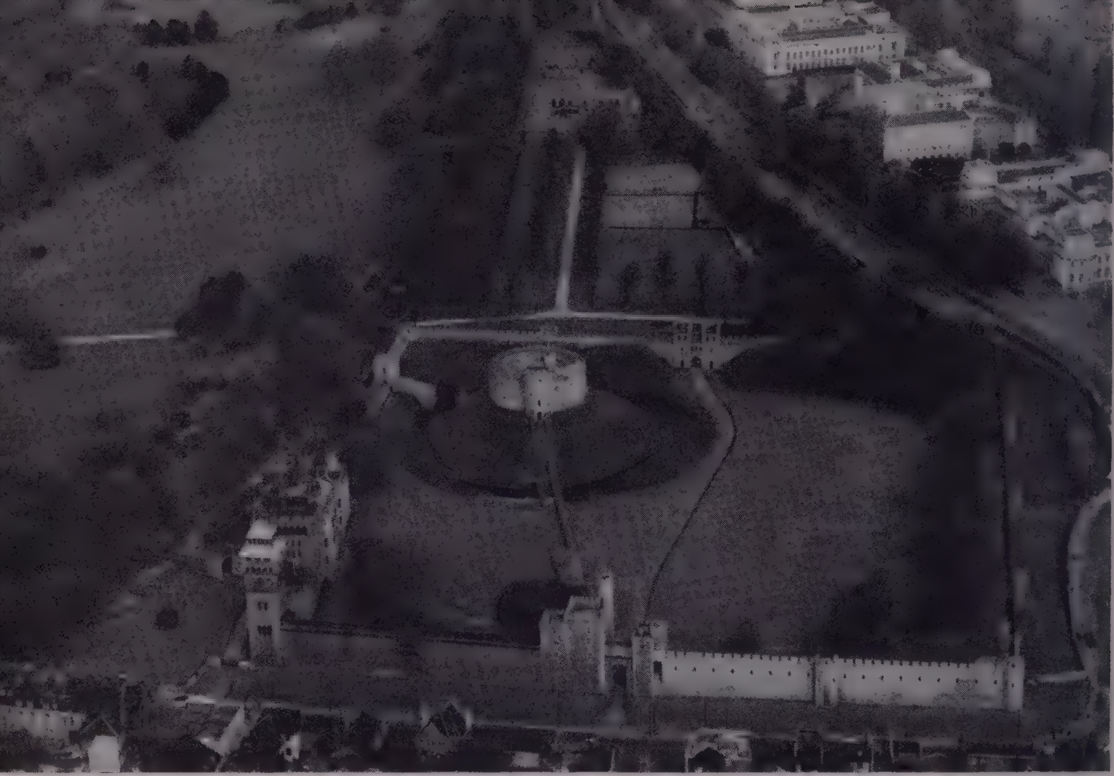
With the advent of the Normans in 1066, a new era set in. The greater part of the Saxon earls and thanes were replaced by Norman knights with their small groups of retainers and the country was parcelled out into knights' "fees" in reward for service under the Feudal System. The Norman Conquest rapidly overran the whole of Saxon England and southern Scotland. When the Conqueror reached Offa's Dyke, he realized the difficult geographical problem confronting him; he solved this problem by dividing what Domesday Book calls the "Marcha de Walis" into four sectors, and handed these over to four of his toughest followers, who were appointed "Marcher Lords", with a free hand to grab and hold what land they could from the Welsh. The Marcher Lords had powers of life and death in their Lordships and the right to wage war independently of the King's writ.

In the north, Hugh Lupus of Avranches (the King's nephew) was created Earl of Chester and established his headquarters in the ruined Roman legionary fortress on the Dee. Roger of Montgomery was created Earl of Shrewsbury, holding the line of the upper Severn. William FitzOsbern was made Earl of Hereford, on the Wye sector, and Robert FitzHamon was created Earl of Gloucester, at the head of the Severn estuary.

From these four strategic bases, thirty to forty miles apart, the Marcher Lords made incursions up the valleys of the Dee, the Severn, the Wye and the Usk, just as the Romans had done a thousand years earlier, and carved out for themselves manors and estates on the fertile valley-floors.

On the extreme south flank, Robert FitzHamon from Gloucester moved by water down the Bristol Channel and established himself in the old Roman coastal fort at Cardiff, where he could dominate the maritime plain of Glamorgan. The southern flank of the Welsh hill-country was thus turned by the occupation of the coastal plain. Still further to the west is another comparatively lowland district—the Pembroke peninsula, intersected by the navigable fjord of Milford Haven. This attracted one of the wilder Norman adventurers, Arnulf de Montgomery, fourth son of the Earl of Shrewsbury. In 1090, making use of sea-power, he landed in Milford Haven and overran the low ground, setting up what Camden in the 16th century called "little England beyond Wales".

But the Norman penetration of this region was definitely limited by geography. Twenty miles inland from the southern coast where they landed, the undulating lowland plain suddenly rises to the steep ridge of the Prescelly Mountain, 1760 feet high. The mounted mail-clad Norman knight could dominate with comparative ease the coastal plain, but whenever the gradient increased to 1 in 4 and he reached the 400-foot contour, his horse's pace was reduced to a walk and, if he tried to push up the thickly-wooded intermont valleys, he was liable to be ambushed by the nimble Welsh archers and spearmen. A frontier of settlement was thus established, more or less along the 400-foot contour, and this military frontier has continued to the present day as a cultural and linguistic boundary. Below the 400-foot contour almost every manor and farm bears an English name; above it the place-names



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The Norman castle at Cardiff built by Robert FitzHamon Earl of Gloucester within the Roman walls. It has a circular stone keep on a motte or moated mount, with a bailey or outer enclosure for the men-at-arms and horses. The original buildings of motte and bailey were in most cases of wood

are pure Welsh, and the Welsh language is still spoken. The same phenomenon occurs along the foothills forming the northern boundary of the plain of Glamorgan.

The Norman Marcher Lords, establishing themselves on the Welsh borderland, met with much the same military problem as the Romans had faced a thousand years previously. The Normans, however, were not organized into legions 6000 strong, but were small bands of independent knights, each with a handful of men-at-arms. They had to dig themselves in quickly, and could not afford the manpower to garrison entrenched perimeter camps as the Romans could. They therefore adopted a device which they had learned in France, that of the Motte and Bailey.

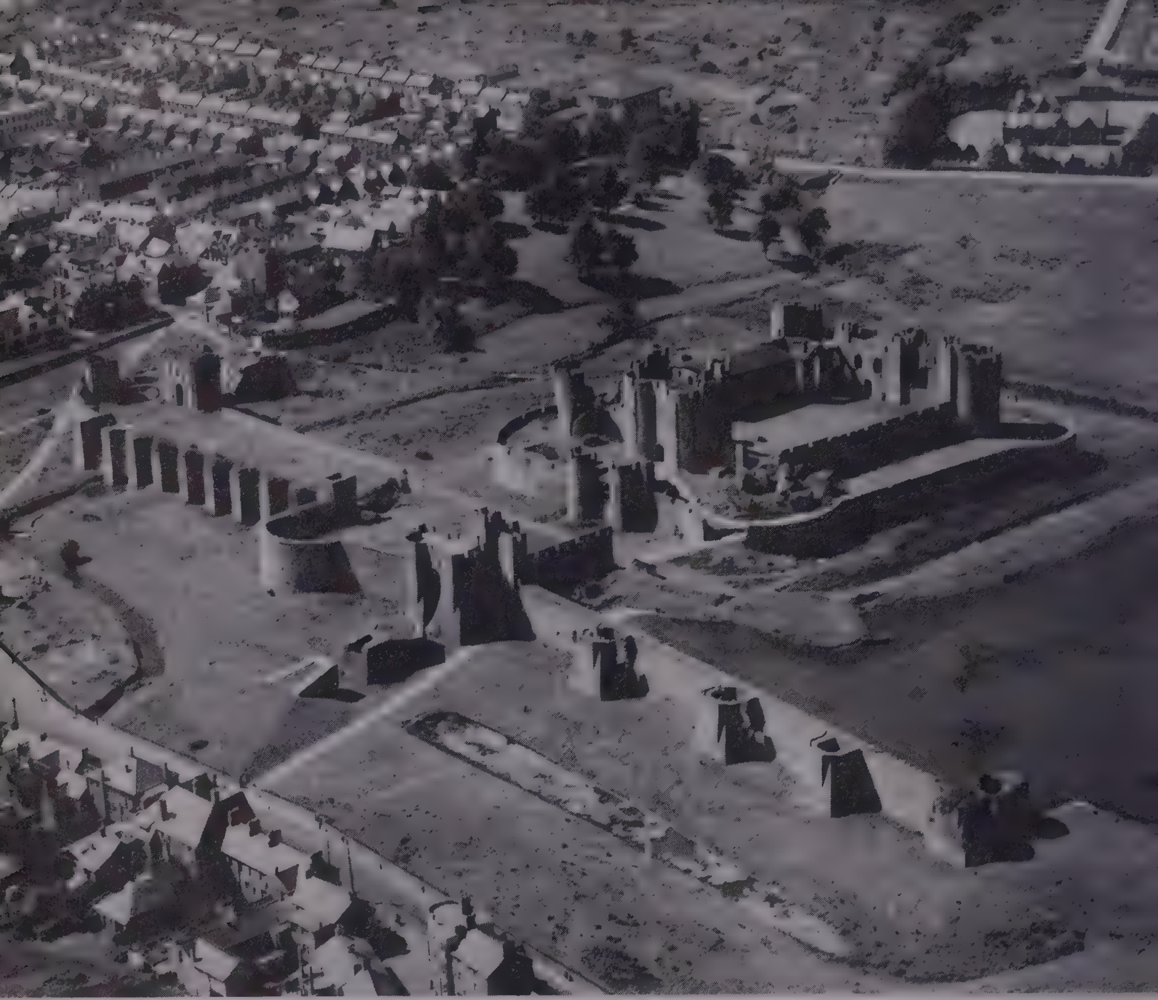
Having chosen a commanding tactical position—and the Norman adventurers had a very good eye for country—they proceeded to erect a Motte, or artificial mound of earth, some sixty feet high and about the same in diameter, surrounded by a ditch with a wooden drawbridge. The motte had a flat top on which was erected a wooden tower, or *bretasche*, surrounded by a timber stockade. Outside the ditch of the motte was an enclosure of a half to three acres known as a Bailey, also surrounded by a palisade and ditch, to accommodate their horses and men-at-arms. These mottes were easy and cheap to construct, they gave good observation and a commanding position for the use of missile weapons, and could be manned by a small garrison. In some cases, such as Caerleon and Cardiff, the motte was erected inside a ruined Roman fort, the outer perimeter of the fort being used as the bailey.

A great number of mottes sprang up all along the Marches and dominated more or less effectively all of the more fertile valleys. At least eighty of them can still be identified along the Welsh Marches, all dating from the 11th century. Their average height above sea-level was 160 feet. They naturally had to be sited on fairly low ground, in order to form administrative centres to control the fertile conquered valleys.

The disadvantage of the motte system was that the buildings were of wood and could be easily destroyed by fire. The Welsh soon

Both photographs by A

(Above) *Pembroke Castle. First built in 1090 as a motte-and-bailey by Arnulf de Montgomery (son of the Earl of Shrewsbury, one of the four original Marcher Lords), it was later rebuilt in stone. Thanks to its fine position on a promontory in the tidal estuary of Milford Haven and to its stout masonry—the circular keep is 75 feet high with walls 19 feet thick at the base—Pembroke, though subjected to numerous sieges, remained a virgin fortress until in 1648 Cromwell breached the outer walls with heavy artillery. Ludlow Castle* (right), *also first built as a motte-and-bailey, was rebuilt in stone between 1090 and 1100. Its site is an ideal one: a limestone scarp affording ample building material, near the junction of two rivers, the Corve and the Teme. Its position on the routes north and south and into Wales gave it a great military and political importance. A lighter event in its history occurred in 1634 when Milton's* Comus *had its first performance there*



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When building Caerphilly Castle in 1266 Gilbert de Clare overcame the lack of a natural site by damming a stream with a great defensible masonry barrage, thus forming a lake in which the castle is islanded. It is a "concentric" one, without a central keep: a design adopted later by Edward I

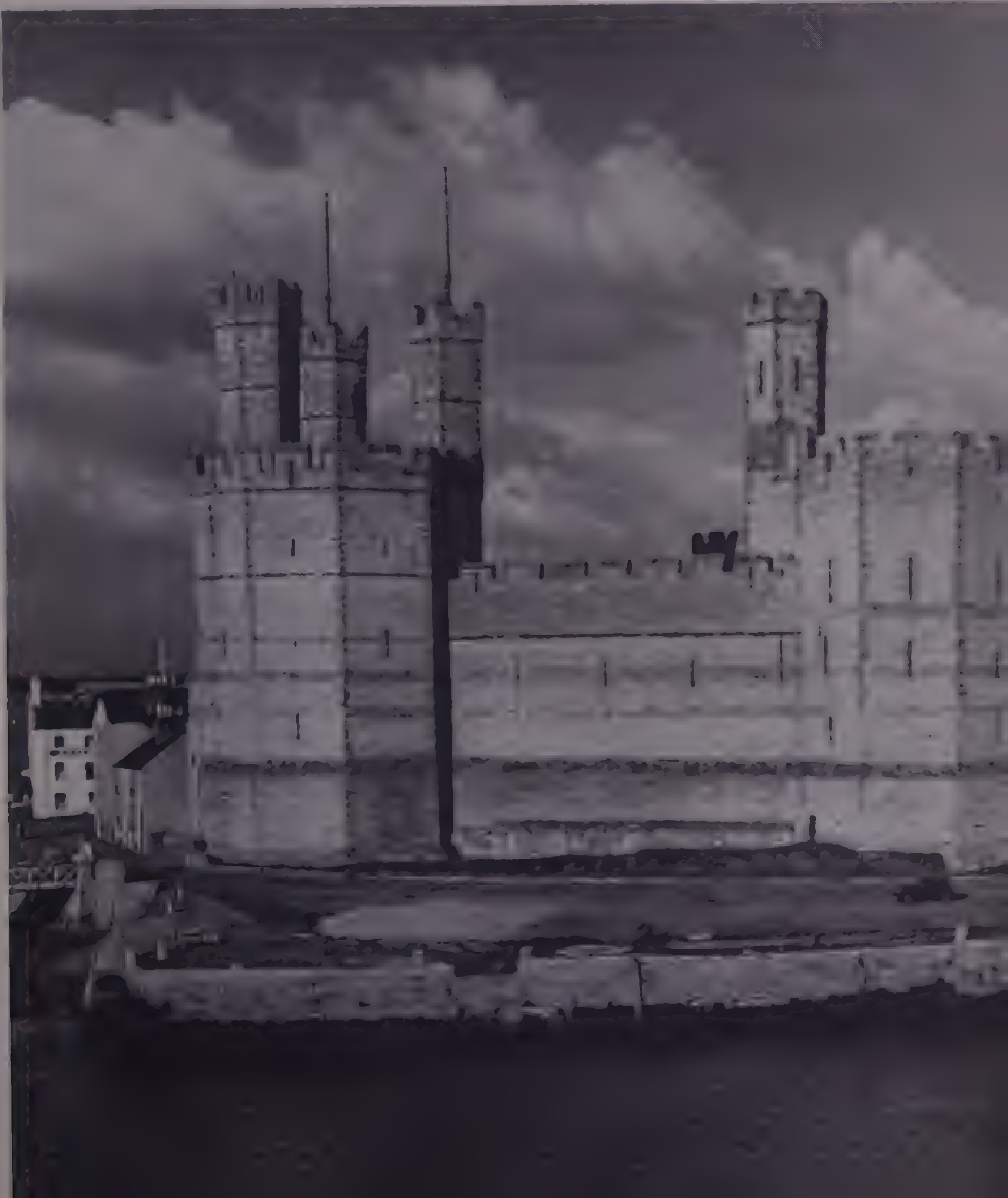
discovered this, and in 1095 there was a general rising of the Welsh tribes against the invader, when a large number of motte castles were burned to the ground. Consequently, in the following century, the wooden bretasches of the mottes were replaced by stone keeps and the great era of castle-building began with Henry I's reign in 1100. The stone castle was either built on the site of a motte-and-bailey, or was erected afresh on some naturally strong position, such as an outcrop of rock.

Throughout the Welsh borderland we find some of the finest examples of the Norman castle. They were sited with great tactical skill, and their imposing ruins still form an impressive feature of the Welsh landscape. The Welsh, too, were not slow to learn from their Norman aggressors, and in the heart of Wales we find quite a few masonry strongholds erected by the native princes, in somewhat crude imitation of their Norman prototypes.

Of the Norman Marcher castles we may note three fine examples, which have survived comparatively intact: Ludlow, Pembroke and Caerphilly. All three typify the Marcher Lords' skill in selecting or adapting a geographical site for defensive purposes.

By the year 1100 the Normans had overrun the whole coastal plain of Glamorgan, with their advanced base at Cardiff Castle. Five miles north of Cardiff there runs an east-west range of steep wooded hills rising to 900 feet in height. For nearly 200 years, this ridge had formed the northern boundary of the

Caernarvon Castle. After the military conquest of Wales by Edward I in 1282, he constructed a chain of castles along the coast of North Wales at Conway, Beaumaris, Caernarvon and Harlech so as to ring off Snowdonia and prevent further insurrection. Caernarvon Castle was begun in 1284 but not finished until the reign of Edward II. Made entirely of hewn stone, its walls still stand virtually intact



Norman settlement, but beyond it, just below the steep southern scarp of the carboniferous limestone massif, lay the fertile Rhymney Valley, some two miles wide, which was still ruled by the native Welsh Prince of Senghenydd, Gruffydd ap Rhys.

In the year 1266 the Marcher Lord of Glamorgan, Gilbert de Clare, Earl of Gloucester, suddenly decided for reasons of policy to annex the district of Senghenydd, north of this ridge, and to maintain the annexation he at once started the construction of an enormous fortress at Caerphilly in the middle of the valley. This valley geographically offers no natural defensive site, but Gilbert de Clare overcame the deficiency by a quite extraordinary feat of military engineering. He erected his huge castle on a low plateau, which had a small stream on the south side of it and marshy ground on the north. Then on the east or lower side of the plateau he constructed an enormous masonry barrage, 380 yards long and 40 feet high, thus damming up the stream and creating an artificial lake of about twenty acres all round the castle walls, rendering it impervious to any siege-operations. The barrage wall was garrisoned, provided with sluices to control the level of the surrounding water, and was itself defended by a main gate-house with moat, a covering barbican, and two drawbridges. The castle itself was enormously strong and of original design. It had no central keep, but was what is called a "concentric" castle, with an inner ward completely surrounded by an exterior enceinte. It is perhaps the most singular castle in the United Kingdom. The "concentric" plan of Caerphilly was adopted twenty years later by Edward I, when he constructed his chain of castles along the North Wales coast.

Owing to the distractions of civil wars and the Crusades, the English Kings failed to follow up the footholds established by the Marcher Lords; the Welsh Princes, secure in their hill-fastnesses and aided by the rugged nature of the country, maintained their independence until the latter part of the 13th century. When Edward I came to the throne in 1272, he decided that the "Marcher Lord" policy had failed; for one thing his Barons were becoming too independent of the Crown. He therefore took matters into his own hands and after five years' fighting finally crushed Welsh resistance in December 1282, when Llywelyn ap Gruffydd was killed; and in the following year his brother Dafydd was captured and executed. Wales was formally annexed to the English Crown in 1284, and a chain of royal castles was erected along the north coast to prevent further insurrection. This chain ringed in Snowdonia, that geographical fortress which, since Roman times, had always shielded the core of Welsh resistance. Snowdonia being an infertile massif of igneous rocks, the Welsh forces were incapable of feeding themselves, as they depended for their corn-supplies on the fertile plain of Anglesey. Anglesey was for this reason known as "the mother of Wales". Edward's chain of castles cut Snowdonia off from Anglesey and the coast; the most famous of these castles are Conway, Beaumaris, Caernarvon and Harlech.

These Edwardian castles, erected between 1283 and 1327, are among the finest in the United Kingdom; they mark the zenith of mediaeval military architecture, before the introduction of those "vile guns" (as Shakespeare called them) upset the traditional and more gentlemanly form of warfare customary in the days of chivalry. It should be noted that, like the Roman legionary fortresses, they were all sited close to the shore to allow of supply and reinforcement by sea.

With the Edwardian conquest of the 13th century we may close our study of the military geography of Wales.

As a postscript, I might briefly refer to one little incident which occurred when I took over the Western Command in 1941 during World War II. After the experience of Dunkirk, our minds were then obsessed with the tank bogey; every water-obstacle, such as a river or canal, bristled with anti-tank defences — concrete pill-boxes, 'dragon's teeth' and so on. On visiting one sector of the Shropshire Union Canal, I found that the defences there were all facing east, and the sector commander told me his orders were to meet a German tank attack from the Midlands directed on Liverpool; in the next-door sector the pill-boxes were all sited to face westwards, and that area commander explained that his task was to protect Birmingham from a German landing on the beaches of South Wales. Having just arrived from the Middle East with the recent experience of a German airborne landing in Crete, I ordered the scrapping of all these linear 'Offa's Dykes', and directed that every vulnerable point should be made self-supporting and capable of all-round defence. The wheel of military geography had turned full circle—almost to the Roman castellum or even the Celtic hill-fort.

Techniques, tools and weapons may change, but the principles of warfare, like the factors of geography, remain permanent.

The Amiable Rice-Growers of North Borneo

by D. P. J. WOOD

The Cambridge Expedition to North Borneo divided into two parties: one, including two zoologists, collected animal and insect specimens above 6000 feet for museums in Britain and Sarawak; while Dr Wood and another geographer studied land-use—especially rice-cultivation—among the Dusuns at a lower level. The expedition received a grant from The Geographical Magazine *Trust Fund*

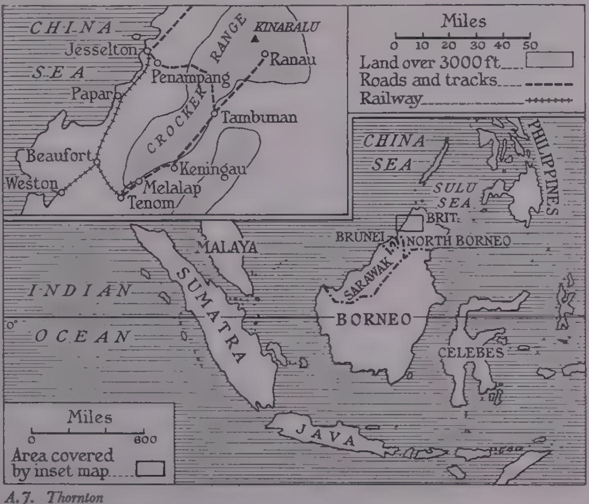
Enclosed by the green hills of Borneo, the Tambunan Plain lies thirty miles south-east of Jesselton across the highly folded Crocker Range. A bridle-path, widened and cut about three years ago through the red earth of the hills into a jeep-track, leads southwards from Tambunan to Keningau, the seat of the Interior Residency. From the northern end of the plain the bridle-path runs thirty-five miles through rolling country to Ranau. The plain is roughly twelve miles long, trending north and south and with a width varying from a half to three miles. Long finger-like spurs sprawl into the plain from the west, cutting it up on that side into a number of valleys. The area is amply and steadily watered not only by the tropical rains, but also by the streams and small rivers flowing down their stony beds into the Pegalan that meanders along the eastern edge of the plain. On this fertile and well-populated land lives an amiable and hospitable group of the Dusuns, the most numerous indigenous people of North Borneo. The Dusuns, who in their heroic days were head-hunters, now farm their plots in peace. It was my good fortune last summer to spend two months on the plain with Brian Moser, another geographer, while the rest of the Cambridge Expedition were fulfilling the wish made long years ago by Charles Darwin to Joseph Hooker: "How I do hope you will get up some mountains in Borneo; how curious the results will be."

Tambunan itself is a pleasant and quiet settlement with a District Office, a small cheerful police-station, a dispensary and a street of Chinese shops crammed with the usual fantastic and wide range of goods of their kind.

This isolated Chinese community on a far boundary of its race's expansion leads an industrious and secret life of its own. The shops are open at dawn; and late into the night from within the tightly closed shutters one can hear the high-pitched staccato clatter of Mah-jongg.

The Dusuns themselves live in thirty-five villages scattered fairly evenly across the plain. Once, it is believed, they lived in the noisy intimacy of long-houses, but now each family has its own bamboo house standing like a giant beetle on stilts above the ground. Wealthy men, perhaps police pensioners because Tambunan is an enthusiastic recruiting-ground for the police of the colony, roof their houses with corrugated iron in preference to the more sightly and traditional bamboo tiles, but this utilitarian sign of civilization's advance is still uncommon. The villages are cleanly kept; pigs, chickens and dogs soon dispose of edible scraps that are pushed between the springy strips of bamboo that make up a Dusun floor.

Apart from rice, the people grow tapioca in closely planted patches, a few vegetables are raised, including onions, cucumbers and



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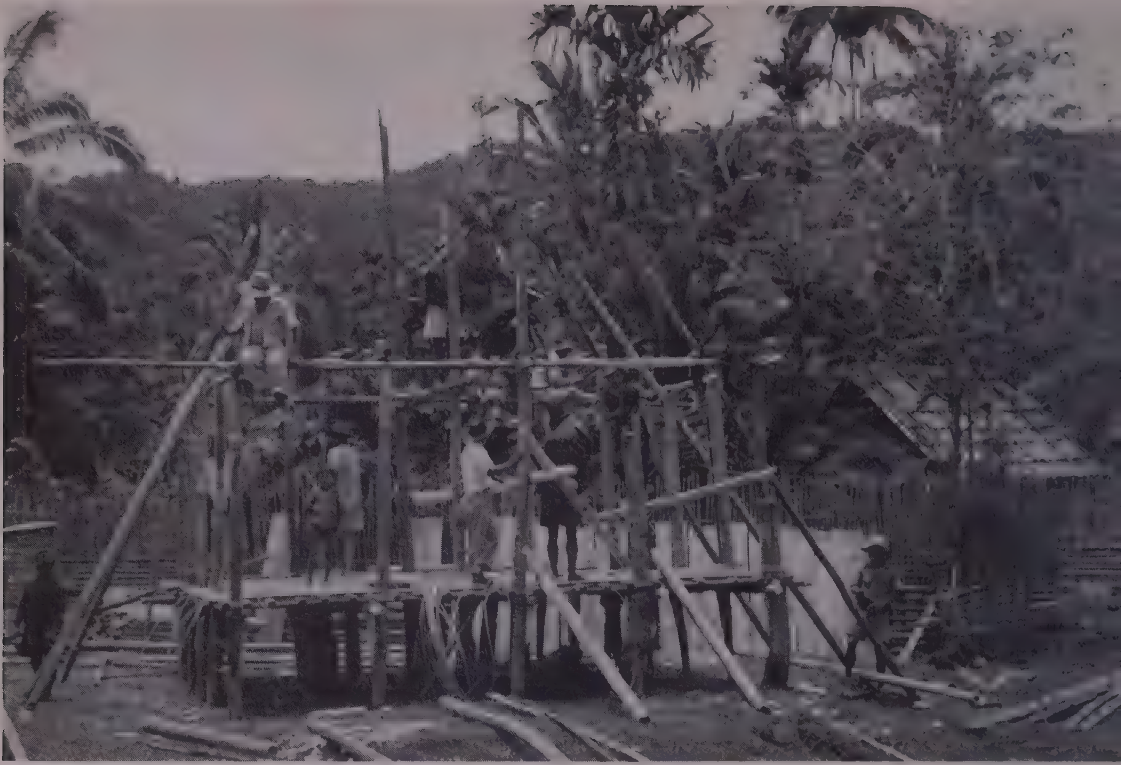


All photographs by the Cambridge North Borneo Expedition

The framework of this Dusun house has almost been completed by the swarm of builders. The bamboo stilts and floor are already in place. Loose ends of the creeper, rattan, used to lash the poles together, can be seen and bamboo sheeting for the walls leans against the fence behind the house

various spinach-like plants and there is some fruit, mainly coconuts, bananas and disappointingly tart green oranges. A few energetic men own small rubber-gardens on the hillsides near Tambunan and owing to government encouragement many more want them. It was common during our stay to see during the hot afternoons long dove-grey smoke-columns rising lazily into the sky from burning jungle-patches on the hills. The remote fires were the work of hill Dusuns who practise a poor shifting cultivation of dry rice but the nearer ones symbolized the hopes of the plainsmen who were burning and clearing patches in order to try their hand at their first cash-crop. In a few years perhaps, the effect of the better communications and rubber will begin to show and the old life which we saw will have gone for ever.

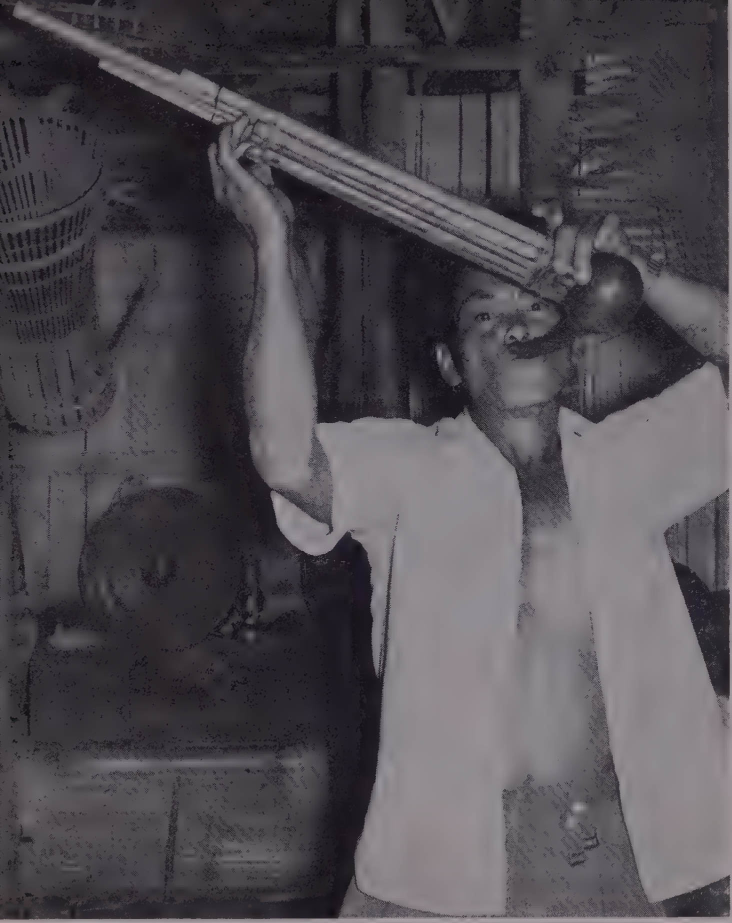
At present rice-growing is the all-important centre of Dusun life and the rest of their agricultural activity plays a subordinate role. The Japanese in their late occupation of Borneo forced the Tambunan people to grow two crops a year but one harvest is sufficient to provide enough rice for them with a surplus to be turned into *tapai*, a heady rice liquor, for the parties which are so prominent and frequent in Dusun society. The North Borneo Department of Agriculture estimated the 1953-4 yield of wet rice of the Interior to be in excess of 500 gantangs per acre (2800 lbs). This is a high one especially when it is realized that modern rice-growing techniques have not yet reached the area. No-one hungers or thirsts on the plain although the diet can hardly be called a balanced one by European standards. Neither cows nor buffaloes are milked, vegetables are little eaten and meat is usually reserved for parties. Small fish from the river or the flooded paddy-fields, and to a lesser extent from fish-ponds, are, together with chickens, fairly plentiful in the Tambunan diet. But rice remains the staple food.

In July, when we arrived on the plain, the terraced fields are grass-covered, and their colour merges into the green of the bunds. These are the little earth walls, built accurately along the contours, that will hold in the water on the terraces. Where the slopes are gentle the bunds may be widely spaced and about eighteen inches high; on steep slopes there may be a three-foot drop from one narrow terrace to the next. This is uncommon, however, and the terracing is nowhere as steep as it is in some parts of Java nor are the fields as wide as they are in the flat coastal plain of Penampang on the west coast of Borneo.

Buffaloes, the most treasured and useful animal of the Dusuns, graze in the fields while they can because once the rice is planted out there is little pasture for them on the highly cultivated plain and they grow lean The seed-beds are prepared at this time. Bamboo fences lashed firm with rattan, a creeper to be had without much effort from the jungle, are erected around the chosen plots where one or perhaps several families have decided to plant the rice-seeds from the last harvest. Usually a fresh site is chosen yearly. Sometimes it is on the outskirts of the village where the family live, sometimes on a hillside or on a parcel of land that cannot be irrigated; but never is a plot used more than twice in succession. The most characteristic organization of Dusun society comes into prominence in this work. This is the *mita tebang*, a working-party of men and women from different households, who agree to cooperate in performing the larger and more arduous tasks which one family alone could only do at the expense of much effort and time. These tasks include both agricultural and domestic ones, such as planting, harrowing, harvesting and building or repairing houses. Labour, implements and buffaloes are pooled, and the only obligation resting on the family for whom the work is being done is to provide refreshments for the workers and a party afterwards at which the tapai freely flows.

After the seed-beds have been dug up with a *chungkal*, the universal digging and hoeing tool of the Far East, and the soil smoothed down, the members of the mita tebang make a joint effort to plant the seeds. The men standing in line dibble holes in the soil with a long stick while the women squat before them in a long giggling row to plant the seed and fill in the holes. Planting is carried out in late July and early August, and once it is over attention shifts from the seed-beds until the vivid green seedlings are ready for transplanting two months later. Fertilizers are not used and the bamboo fences keep out domestic animals and all but the most agile poultry. The rice-rat, however, is often a greedy marauder in the beds. Unlike the

Villagers taking their buffaloes to the jungle to collect bamboo poles. Dusuns consider buffaloes and gongs to be their most prized possessions. An esteemed way of repaying a debt is by the promise of a calf in the womb. Buffaloes are used for transport and field-work, not for milking



A Dusun playing the melodious simpotun, *an instrument made of a gourd and eight small bamboo pipes. Displayed on the platform behind is a gong, a treasured piece of family property*

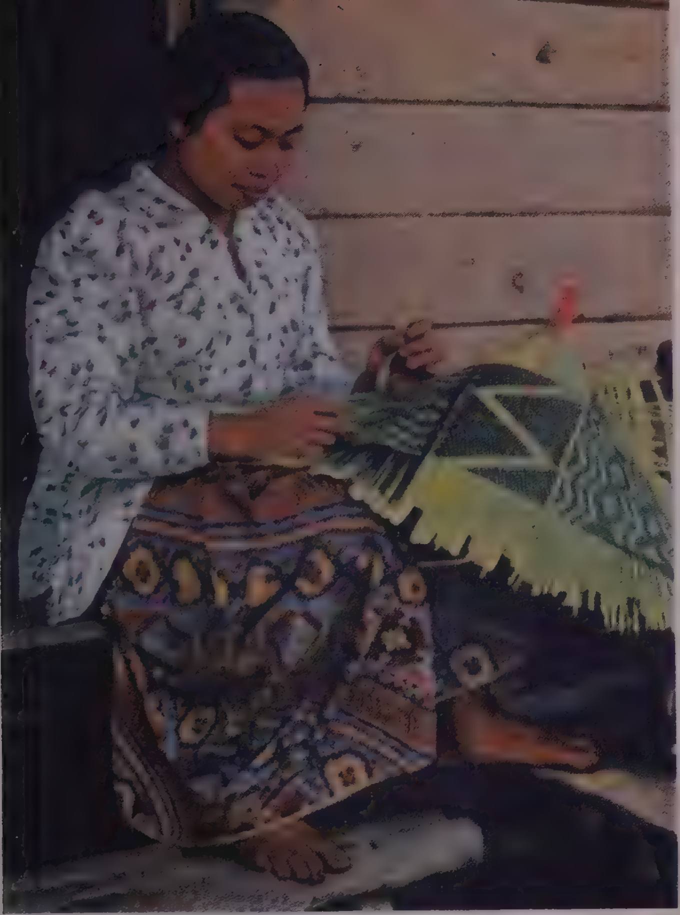
custom in some parts of Malaysia the young plants are not shielded from the sun by a covering of broad leaves.

Yet in the terraced fields themselves there is much to be done. In some places earth-dams, stiffened with lengths of bamboo, are constructed to divert the water of a stream into the highest of a series of terraces. In other fields a low embankment has merely to be breached to allow the water to trickle in for the first irrigation. There is little disagreement over the timing of this important operation. In some villages the headman, the *orang tua*, decides the date of flooding; in others the owners of the plots on a series of terraces agree among themselves; yet again in other places the date seems to be hallowed and fixed by past usage. None of the rancour exists that sometimes sours relationships in farming communities elsewhere where efficiency depends on an equable sharing of water.

As the water gently seeps over the terraces and down through gaps or bamboo pipes onto the lower levels, men and women build up with dollops of mud the bunds which have crumbled since the last irrigation. The buffaloes are encouraged to splash about the fields so that the killing of the grasses is hastened by their sharp hooves. By early September much of the plain has been transmuted, as it were, into a series of mirrors reflecting the endless procession of tumbled clouds overhead which are one of the charms of Borneo. When the fields are really soft most of the water is drained off and they are harrowed twice. The harrow is a home-made wooden implement, about two feet square, with eight or nine wooden teeth embedded in it. It is fixed by lengths of twisted rattan to the yoke of the buffalo. The driver stands on the harrow to weigh it down and steers the buffalo by a rattan strand attached to the animal's nose. In order to slide the harrow into awkward corners of a terrace the driver sometimes levers himself alongside the bund by pulling the buffalo's tail. Harrowing, and steering by the tail in particular, is an occupation favoured by the boys who show much skill as they try to make their reluctant buffaloes break into a trot.

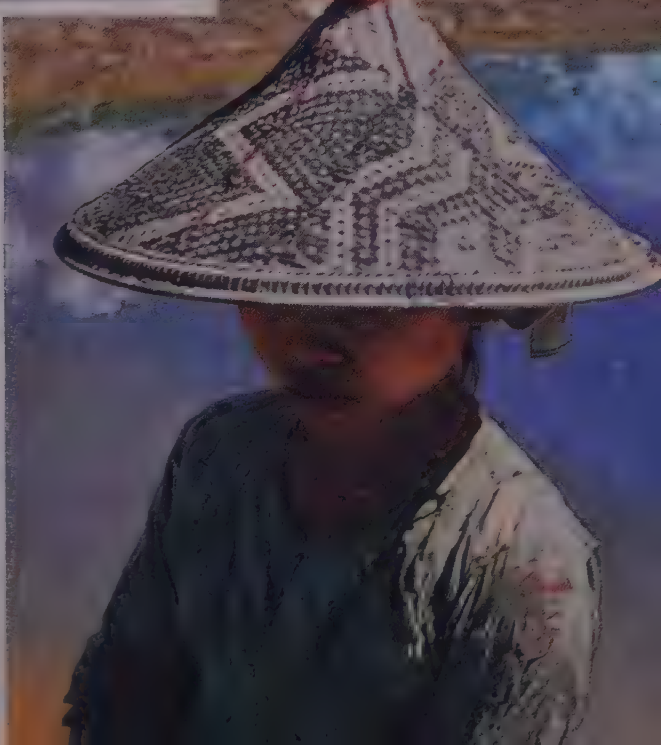
A few farmers plough their land with a wooden plough as well but this is rare. In some fields large stones make ploughing inconvenient and everywhere the soil gets soft and muddy enough without it. Some Dusuns, moreover, fear that ploughing will stir up infertile soils to the surface.

When the fields have been harrowed the most picturesque part of the cultivation begins. The terraces are flooded once more and the members of the mita tebang with bundles of rice seedlings in their arms squelch into the fields. The workers, both women and men, make holes in the mud about eighteen inches apart with a short stick, sometimes tipped with iron, and drop a

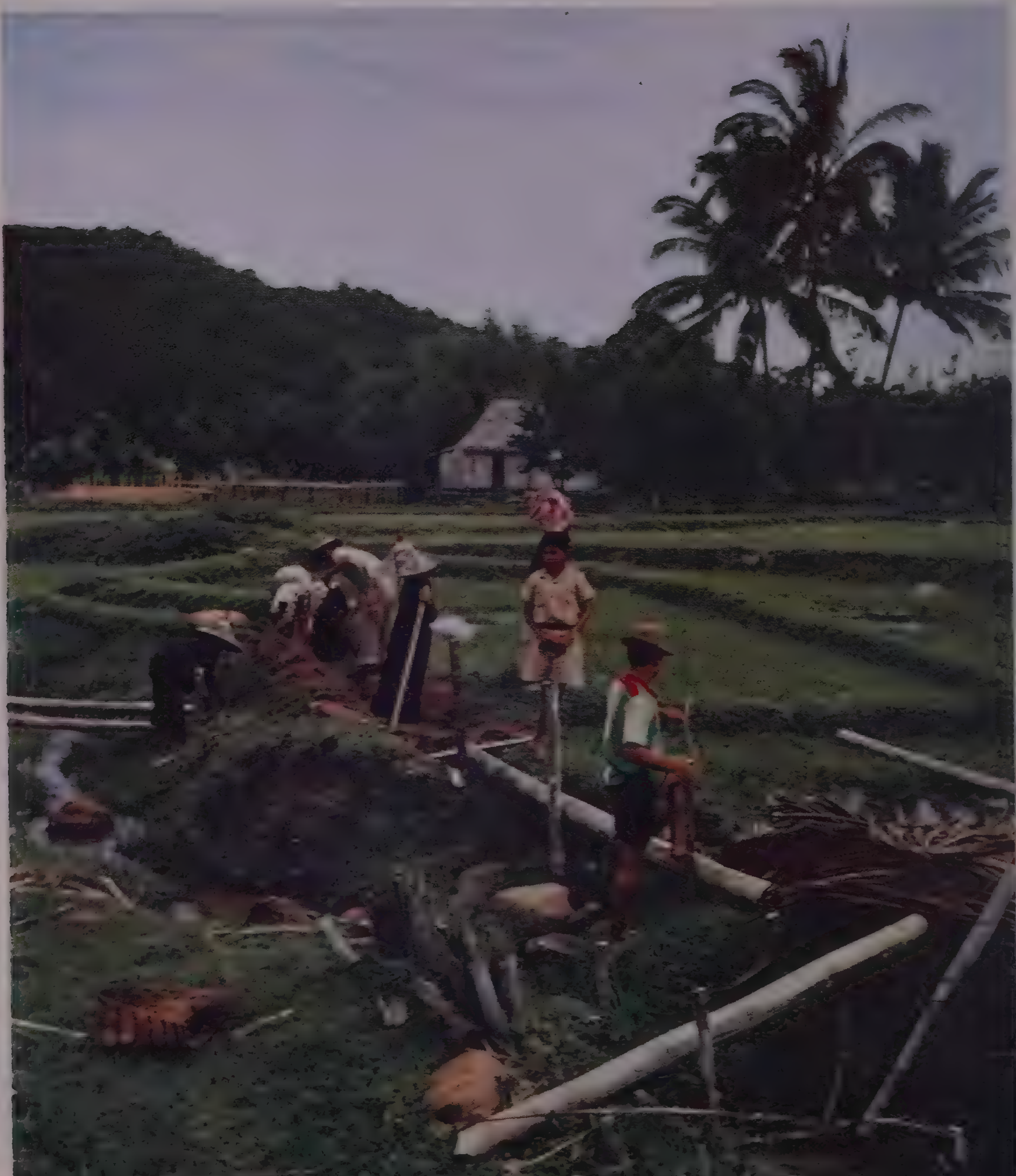


During slack periods in the rice-cultivation Dusun women have plenty to do at home. Here a girl is busy on the slow and intricate task of making a hat. She is a member of a family that is rich by Dusun standards, for her house is built of plank walls and is covered by an unsightly corrugated iron roof. It is the ambition of most Dusuns on the Tambunan Plain to own such a house as they last much longer and need less upkeep than the traditional and more pleasing bamboo ones. Unlike the men who dress nowadays in prosaic shirts and shorts and often a trilby hat, the women bring colour to the scene with gaily patterned bodices and sarongs which they buy in Chinese shops or in the market held every Sunday morning in Tambunan

All colour reproductions are from Ko



The picturesque Dusun hat is plaited from narrow strips of bamboo and is worn by the women for protection from the sun when they are in the fields. The pattern, which is picked out in black and red, and the gay top-decoration of scarlet threads and small cowrie shells brought from the coast, are peculiar to the Tambunan Plain. Women in other parts of Borneo wear conical hats with different decorations and patterns, so that it is possible to tell at once, from her hat, where the wearer comes from



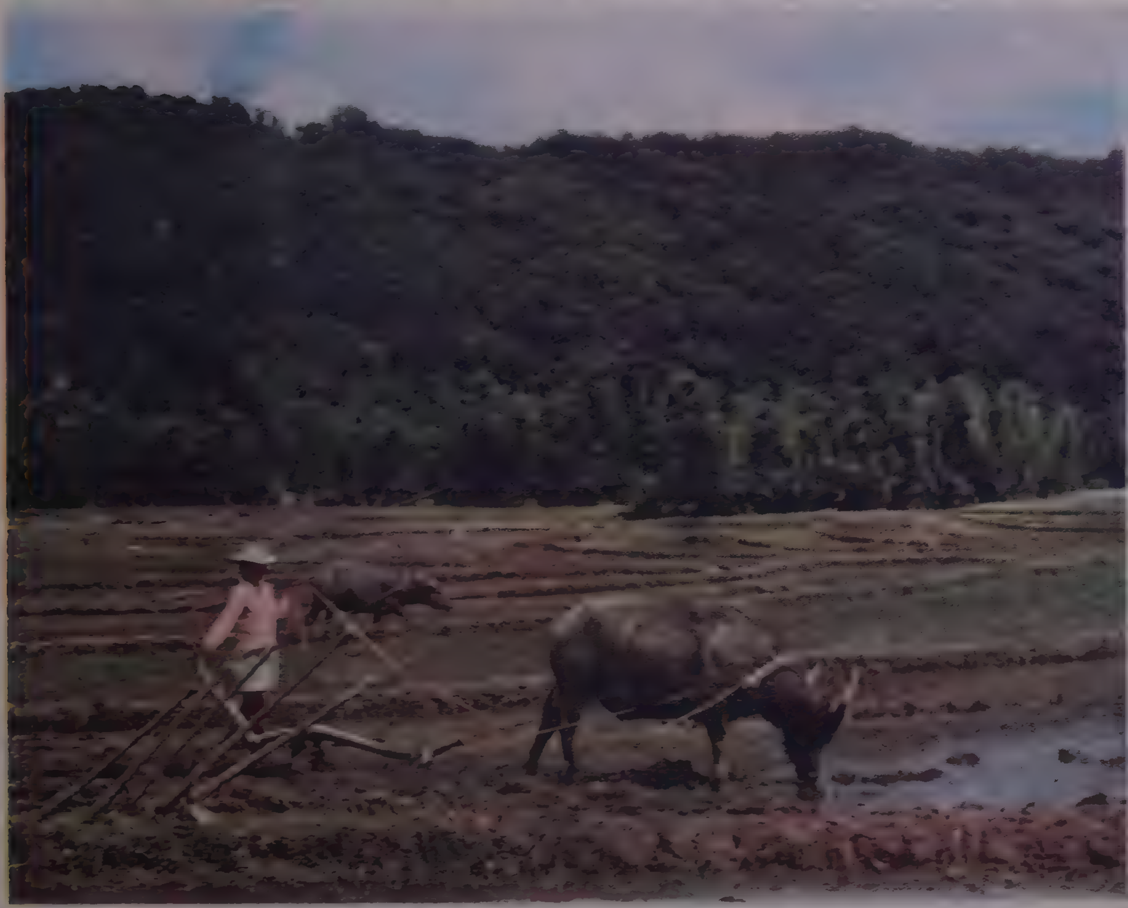
Members of a mita tebang *or working-party of men and women from a village near Tambunan on the banks of one of the many little streams on the plain. They are building up the bunds and also constructing a small dam out of earth and lengths of bamboo so that the water can be diverted into the paddy-fields. In the background by the house there is a rice seed-bed surrounded by a fence. In a few days the fields will be flooded and the house and seed-bed will look as if they are on an island* number of seedlings in. If the seedlings are unusually large only two or three are pushed in, but more often five or six are put in together. This is a more skilful operation than it sounds because the hole has to be found underneath the yellow-brown water and the plants inserted about two inches before its soft muddy sides cave in.

After a week the water is drained off the terraces again for a few days. This is to toughen the stalks of the plants by exposing them to the air and to kill off a stem-boring and water-loving insect that can cause great damage if left unchecked. This period of dryness has dangers in its turn because if the ground dries off too much, cracks appear on its surface and the *suruk*, a cricket, crawls in to eat the tender, fleshy part of the rice-plant near its roots. This process may be repeated in the next few weeks.

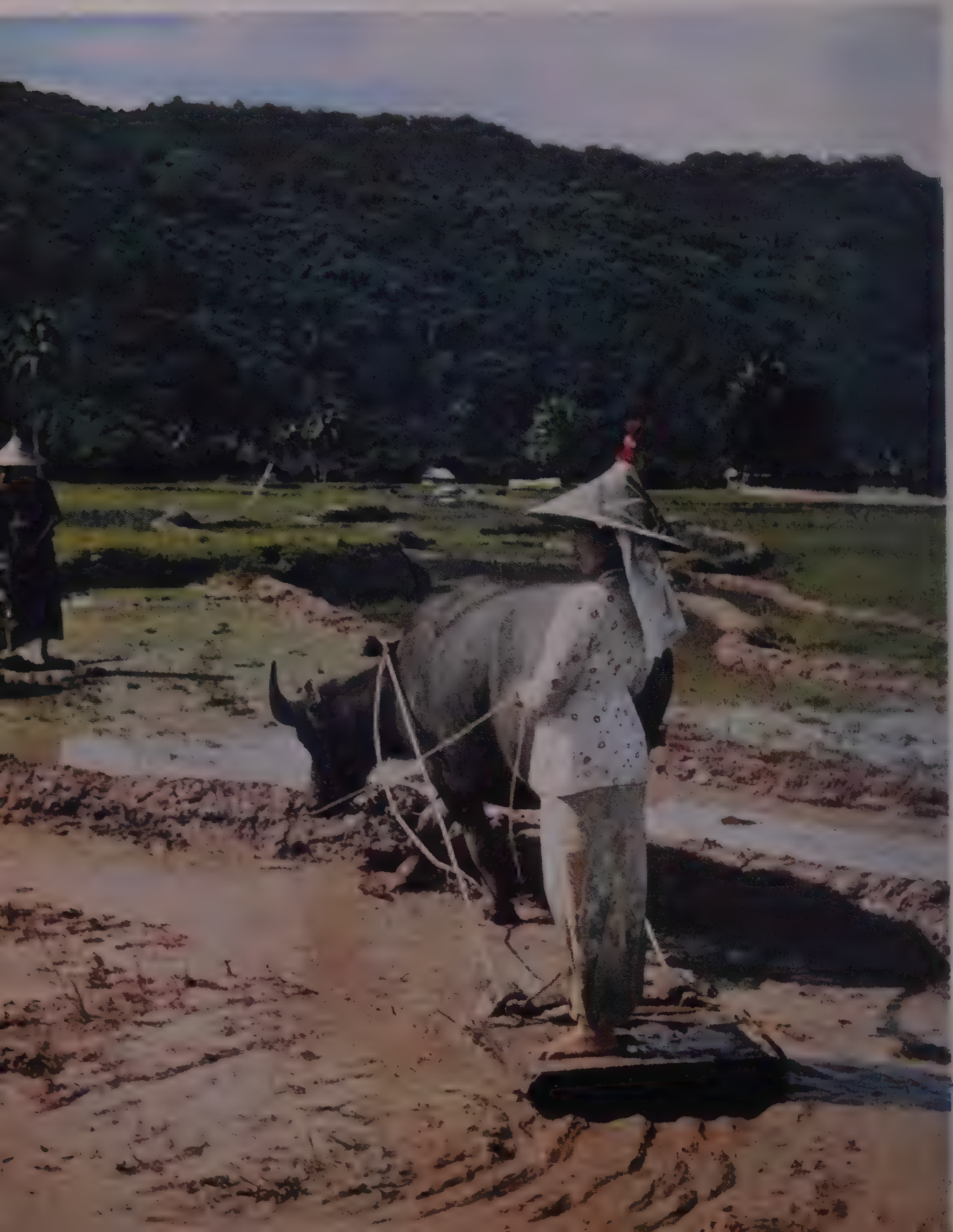
In January as the tall rice turns ripe and golden (one of the many varieties favoured in Tambunan grows to the height of a man) the water is let out for the last time before the harvesting at the end of the month. Another period of hard work begins for the Dusuns. The harvesters work long hours and often do not return to their village at the end of the day but sleep in the little huts called sulaps which are built in the fields. The main purpose of the sulap is for storing the freshly cut rice until it is all gathered in.

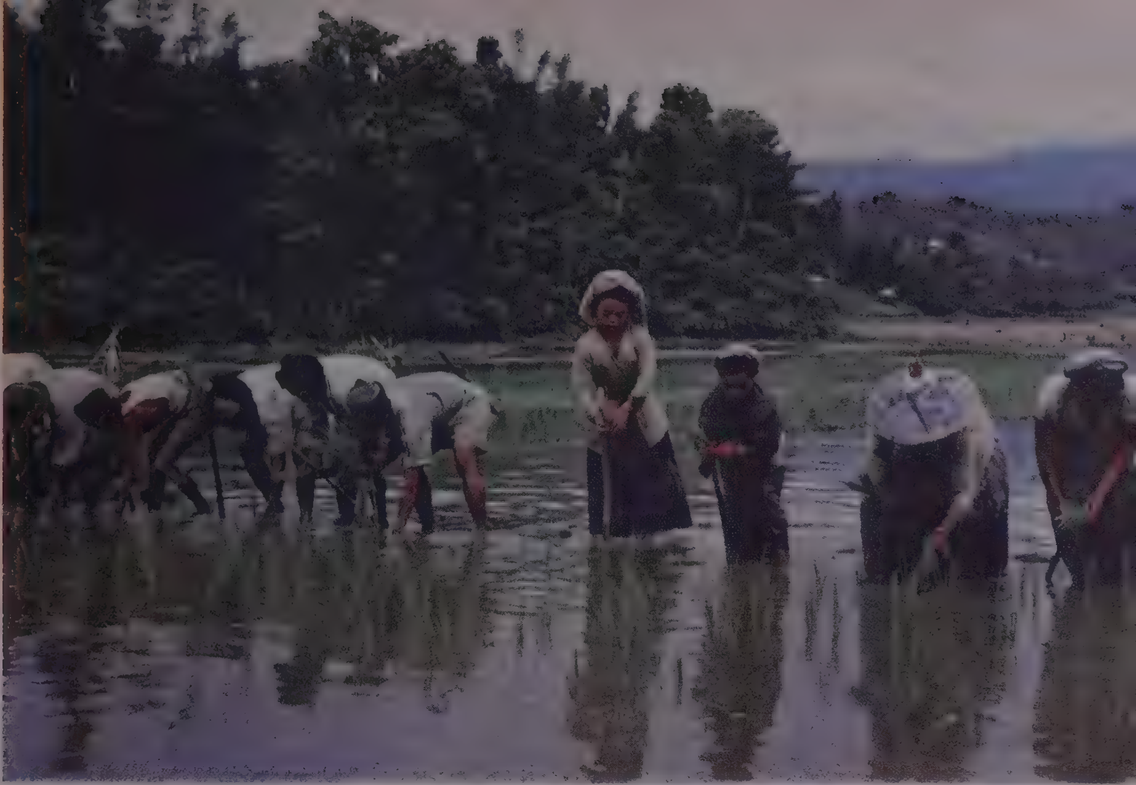
The rice is cut with a special knife just below the ear and is usually threshed outside the sulap. This is a jolly time as the threshing is done by dancing feet on a large corn-yellow mat woven of sago leaves, sometimes to the accompaniment of songs. More rarely the Dusuns thresh on a raised bamboo floor fixed inside the hut. After threshing the rice

In front of a magnificent stretch of jungle a young Dusun farmer is ploughing his fields, though few Dusuns consider ploughing necessary. His plough is simple and light and can be managed with one hand. It is built in the village from hard wood cut in the hills that surround the plain



In the cycle of rice-cultivation, harrowing is always a cheerful time. Women stand nonchalantly on the harrows as they guide the buffaloes, either from the nose or by the tail, round and round the muddy fields. Usually the fields are harrowed twice before being judged ready for the transplanting to begin





(Above) *Transplanting is a backbreaking and tiring operation but the Dusuns can look forward to a party, with plenty of rice-wine, given by the owner of the fields when all the seedlings have been planted out.*
(Below) *A view over the plain. The bamboo fence is to prevent animals from straying into the fields*

Dusun housewives winnow the stored rice according to family need. After it has been pounded up to loosen the husks, there is nearly always enough wind to make winnowing an easy task

is carried in baskets to the permanent storehouses in the villages and poured into great round bins made of bark. The people will not keep the rice in their houses as they fear the dangers of fire. The rice-bins have a loosely woven bottom to allow ventilation and it was stated that before the Japanese occupation some families had rice over ten years old in their bins. This was sweet except for a slightly musty flavour.

Once the harvest is home the people desert the fields, where the rice-stalks rot and are eaten by the hungry buffaloes, and give themselves up to parties which can be considered monumental, even by Dusun standards. Now all that remains to be done is for the women to pound up the grain in hollowed-out wooden blocks and winnow it whenever the family have need of rice.

After the harvest and while the rice is growing to maturity the Dusuns have time for other pursuits. Some of them leave the plain for a few weeks and go to the European and Chinese rubber-estates nearer the coast to work as tappers. A few of them walk through the Crocker Range to Penampang along a jungle track that was once the main line of communication with the coast. Others travel by Chinese-owned Land-Rovers to Keningau on their way to the estates. A few men work for the government keeping the bridle-path and jeep-track in good order.

At home there is much to do. There is always a new house to build or an old one to repair. Hunting deer or wild pig in the jungle with shot-guns, which have ousted blowpipes and traps, is a popular pastime. Much time is spent in cutting bamboo in the jungle or in the dense stands along some of the streams on the plain and in dragging it back to the villages with buffaloes. This most important raw material is then cut and shaped or beaten flat into numerous articles. At birth a child's umbilical cord is often severed with a bamboo-knife, his greatest earthly pleasure will be drinking tapai in a bamboo-house out of a bamboo-cup and when at last death overtakes him he will be lowered into the grave wrapped in a bamboo-shroud.

Yet the course of life itself from birth to death would be impossible for the inhabitants of this friendly plain without rice; as indeed it would be for the millions of peasants in South-East Asia who depend upon rice-cultivation for their hard existence.

The Widow Back's Kentucky Home

by R. J. McGINNIS

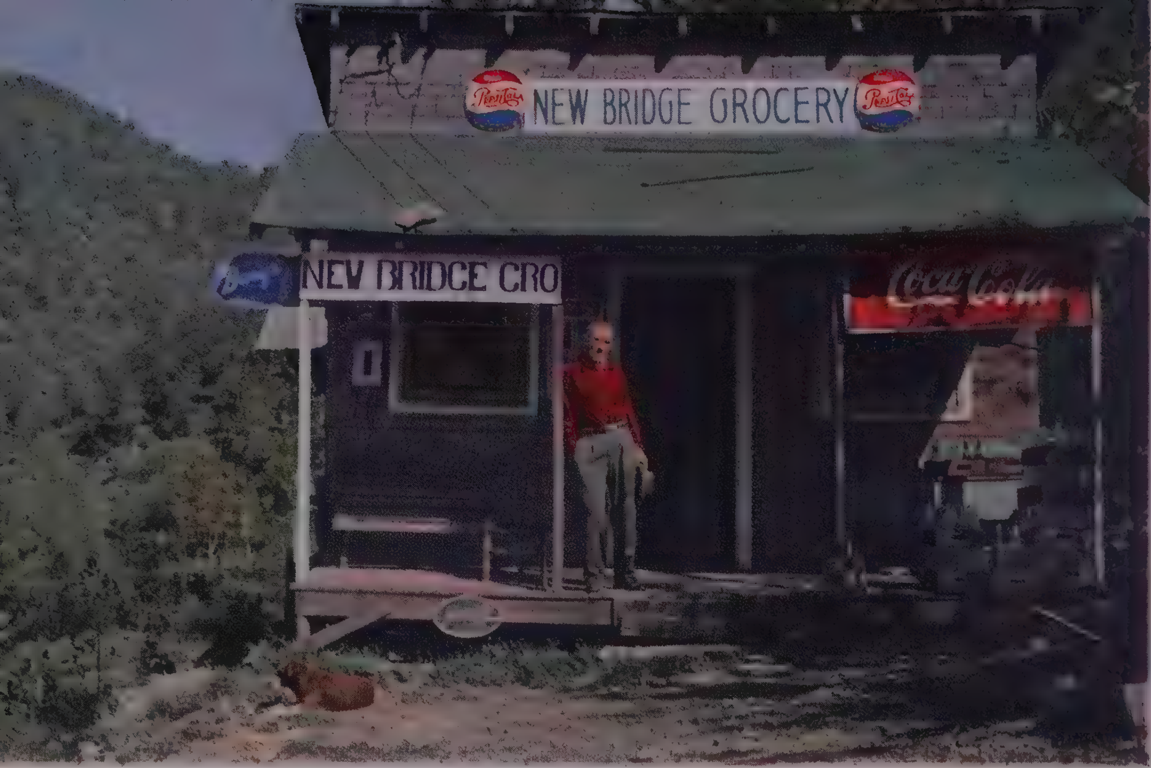
Mr Usborne's article in the present number describes renewal and revival in a part of the American scene unfamiliar to most non-American readers. The portrait of an older America, in a neighbouring State, is drawn for us by the Editor of The Farm Quarterly, *Cincinnati, Ohio*

THE sun touches the Widow Back's kitchen window about ten o'clock in the morning, a little earlier or a little later, depending on the season. It drops behind the mountain to the west in mid-afternoon. Most of the fall and winter it doesn't appear at all, for the mists and fogs hang in the hollows and grey clouds cling to the mountain-tops for days on end. From ten to three, that is the day; the rest is morning and evening and night, a life in the shadows.

Martha Back raised nine children in a three-room clapboard cabin on a thirty-five-acre farm in the high hills of southern Kentucky. She is seventy-eight now, a widow for fourteen years, and she lives alone in a house she came to as a bride. She has a touch of rheumatics in one hip, but she gets around well and on good days will walk the mountain paths to visit neighbours or a son who lives across the valley. Several years ago, from her first old-age pension cheque, she got herself a set of "store-boughten" teeth. They are a little loose and she doesn't dare smile as wide as she might. She is lean and scrawny and wears her hair in a tight bun on the back of her head. Her eyes are china-blue, like those of her Scotch-Irish ancestors.

If Martha Back knew how a family of eleven was clothed and fed and schooled on two acres of corn and beans, a few half-wild sheep on the mountain, and a flock of geese which wandered up and down the branch brook), she would tell you. "I can't tell you properly what we did", she says. "You would have to do it yourself to know how."

When John Back married Martha Dixon fifty-four years ago he took her to a new two-room log-cabin on Spring Branch. He had thirty-two acres, a mule, a dozen or so sheep, a hillside plough, and a mud-sled which he had made himself. There were several strips along the branch which added up to a little more than an acre, and about an acre on a cleared hillside where he planted corn, beans and a vegetable garden. Martha's mother had given her a pair of geese and a setting



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(Above) *The New Bridge Grocery Store, where the Widow Back gets her few "store-boughten" requirements.* (Below) *Grinding sorghum-cane to make molasses. Molasses from this source was used by the mountain people of Kentucky as a home-grown sweetener in her young days when self-sufficiency was their pride*

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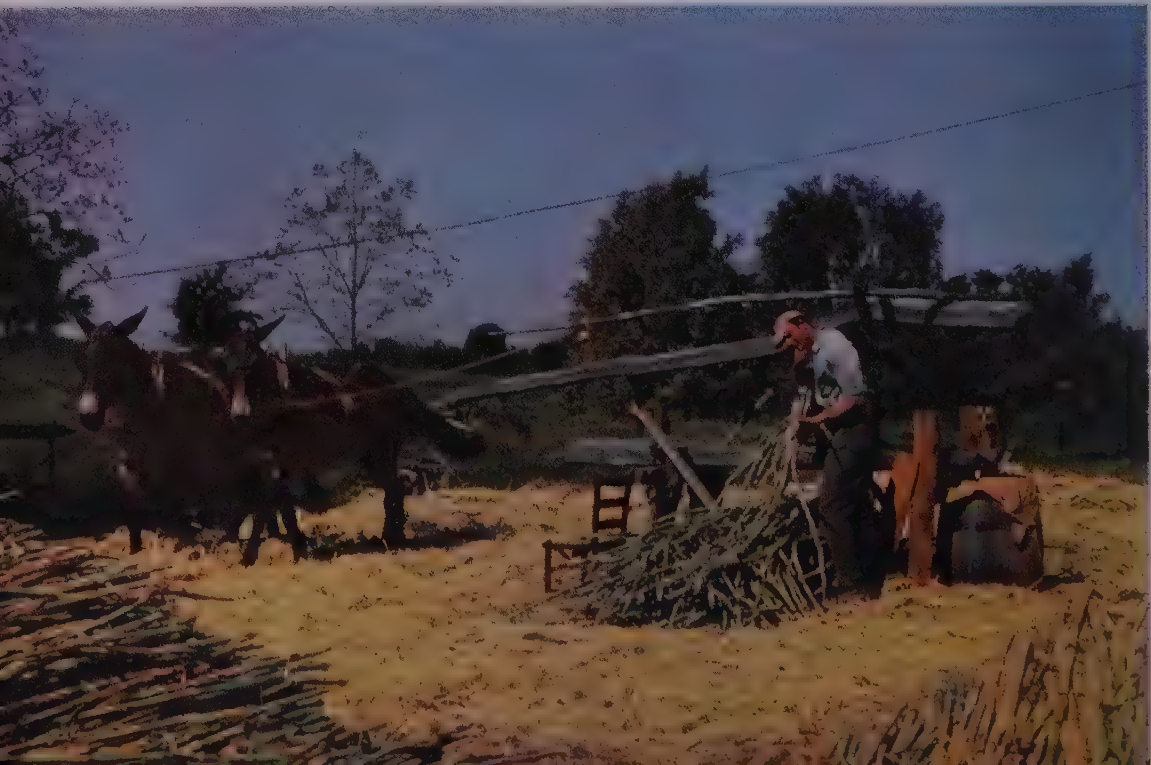


hen with fifteen eggs under her. In the house were a home-made bedstead, three hickory split chairs, a table, and an odd collection of pots for the fireplace. There was a corn-husk mattress on the bed and two quilts which Martha had pieced together herself during the three years that John came over the mountain to court her.

When the corn was picked John loaded half of it on the mud-sled and took it to the mill at Indian Bottom, eight miles away. The other half of the corn went into a pig which a neighbour had given him for a week's work cutting fence-posts. Martha combed and carded the wool from the sheep, carried it to her mother's loom, and made a strip of cloth for their winter clothes. She sewed these by hand—dresses, shirts, trousers, coats, everything from the same strip of cloth, scratchy and rough, but durable and warm.

She plucked the geese to make their first pillow and used the fat from the hog to make lye soap, draining ashes from the fireplace to make the lye. Their diet, day after day, was corn-meal mush, beans and back-fat. That winter John made $15 working in a sawmill. They spent $4 on a wooden pump for the well and the remainder on salt, thread and odds and ends. "It just slipped away", Martha says. "We spent it all and I can't remember for what. That's the way with money."

Then the children began to come. The corn rows were pushed a little further up the hillside, and even the patches on John's overalls were patched. Months on end there was no money in the house; it was either borrow, barter, or trade. John helped a neighbour put up a chimney and brought home a ham; Martha could make the best soap on the branch—white and hard and clean-smelling. She traded a bar here and a bar there for salt or a jug of sorghum molasses or the rare luxury of coffee.

The winter after their third child was born a lumber company began to log off the mountains and John got work with his mule, snaking the logs down to the river and then, when the spring freshets came, floating them to the mill at the railroad, twelve miles away. He cleared a little more land on the hill, put in more corn. Sometimes he had enough to make a jug of corn whiskey. He and two of his neighbours bought a length of copper tubing, set up a still in the dead-end hollow near a spring. Working at night so that the smoke would not give them away, they jugged the clear 'moonshine' and brought it down to their cabins.

"We all took a sip in the morning and just before we went to bed", Martha recalls. "The kids too—and we never had any colds or rheumatics or stomach-trouble."

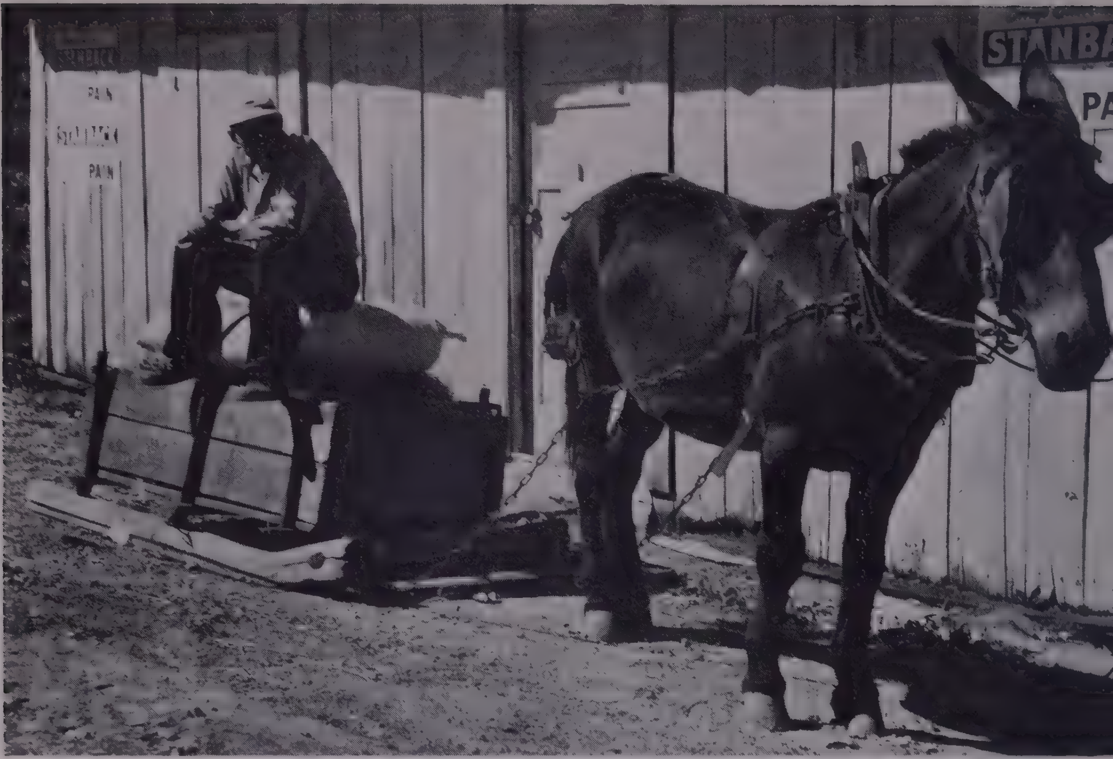
For many years John made his 'shine, unmolested and untroubled. It was like a crop, a part of the family diet. Sometimes he sold a little or traded some to a neighbour who was short. But he wasn't in the business and he couldn't understand why the government wouldn't let you make your own beverage the same as you could grow your own corn for meal.

Shoes were the biggest clothing-problem for the growing family. Martha's uncle was a shoemaker, but he lived at Indian Bottom, a good day's travel from Spring Branch. Once a year John loaded his family on the mud-sled and, with two calf-hides he had tanned himself, paid Uncle Hugh Dixon a week-end visit. Uncle Hugh took the boot-sizes of the family and a month later the work was done. A pair of boots lasted a year or more. They were boots, not shoes, and sometimes as a special favour Uncle Hugh put on copper toe-plates for the boys.

The children attended school at Jeremiah, a village two miles from their cabin. If they managed three or four days a week they did well. Often in winter the hill-trails were too difficult, and in the spring and fall they missed whole weeks, helping with the farm-work. Truant-officers and school-buses were unknown to them, and if they acquired a working acquaintance with the three Rs at the end of their short school-life, they were contented. There were few who knew more than how to 'cipher' and spell out the Bible.

They learned more on the mountain and in the fields than they did from the underpaid teacher. As soon as they were old enough to walk they scoured the mountains for nuts in the fall, sassafras root in the spring, blackberries, wild grapes, paw-paw and "poke greens", a composite salad made with dandelions, poke-weed and watercress. They hunted small game at all seasons. They held the wicks while their mother poured the candles and carried the lead-pot from the fire when their father poured the bullets for his long rifle. They learned to shoot straight and fear strangers and how to fight "rough-and-tumble". They joined their elders in a dipper of moonshine before bedtime . . . Those that survived were tough and resourceful. They became self-sufficient like their parents; they knew how to endure privation, how to "git along".

(Above) *The mountain homes of Kentucky are all cut from the same pattern: two or three rooms, a front porch running the length of the cabin and a back "stoop". This is Martha Back's home. It was built for her as a bride. The original logs have been covered with clapboards. The central fireplace serves the two rooms.* (Left) *From her front porch Martha Back must look upward to see the sky, so deep is the Kentucky valley where she lives, and no sun reaches it till mid-morning.* (Opposite) *The swinging bridge is found in many parts of Tennessee and Kentucky, the only means of reaching houses across the deep gullies. These children are starting their three-mile walk to school*



Mule and mud-sled are the means of transport in the Widow Back's part of Kentucky. The narrow trails along the mountain valleys will not permit wheeled vehicles. This farmer has come twelve miles to have his wheat ground. Posters advertise patent medicines which are consumed in quantity

In the Back home money could never keep up with the children. Eight of them came along in twelve years. The four double beds just about filled the two rooms in the cabin, and ten hungry mouths had to be fed from the little corn-patch and the kitchen-garden. Martha had to skimp and make do. A calico dress lasted her for seven years, for she wore it only to church and funerals.

No-one could afford to be ill. The doctor was fourteen miles away and he charged fifty cents a mile, going and coming, for a visit. A midwife brought Martha's children to birth and home-made potions and ointments had to take care of the day-to-day illnesses. One of the boys broke a leg and that cost them $25, which they were two years in paying. Bad teeth stayed in until one got the courage to have them pulled with a pair of pliers. One just wore out the measles and whooping-cough and drank moonshine for all the common ailments. The weak died and the strong survived, all a little undernourished, a good deal overworked; and one was always tired.

Martha Back's ancestors came from Virginia and the Carolinas. Originally they were from England, Scotland and Ireland, the 'have-nots' from the Old World; many were indentured servants. The New World, which had promised them so much, gave them little—perhaps a patch of land and a log-cabin, and game in the forests. But they could not compete with Negro slaves in the labour-market and they became rural slum-dwellers subsisting on the crumbs that fell from the tables of the great cotton- and tobacco-plantations. The Negro slaves had more, so much more that they called them "poor white trash".

When game became scarce they filtered down the mountain valleys to the west and north. Sometimes they went alone, on foot or mule-back, sometimes in parties. They went for a few weeks or a month, to get the winter meat, or they stayed the season, trapping the mountain streams. As they ranged further into the mountains and the trips became longer and more arduous they began to take their families along, built rude log-cabins along the branches, planted a patch of corn and beans to leaven the constant diet of bear-meat and venison. The trails threaded the streams, narrow and steep as they reached the headwaters, vanishing at the last cabin on the branch. There were no roads.

Life was the same constant struggle against the hunger they had always known. But here in the mountains they had something they did not have in the tidelands . . . freedom: freedom from taxes, freedom from law, freedom from the form of slavery that goes with poverty in a cultured society. Here they could live like men, ruled only by their fierce pride and their ability to pit themselves against Nature. This pride and self-sufficiency they got from their Anglo-Saxon ancestors, and they retain it today in a great measure.

For almost a hundred years, as long as the game lasted and the law kept its distance, this was the way of life. No new blood came in, for the soil was giving up its maximum, and would support no more. A young man went to the cabin up the branch for his bride; when his children were ready for marriage, they too went up the branch. It was easier than walking miles, all uphill, to the next branch to court a girl who might ultimately refuse the honour, or whose brother might take a pot-shot at you because all strangers were suspect. So there was inbreeding from the start; today everybody seems to be related, and the same old English names of Adams and Collins and Caudill crop up all over the Tennessee and Kentucky mountains. The inbreeding produced an annual crop of idiots and undernourishment contributed much to the decline of the stock. By the turn of the 19th century the Kentucky and Tennessee mountain people were marked with a stigma—they were "hill-billies", and hill-billy was not a complimentary name. They settled into a pattern, tall, lean, hawk-nosed, thin-haired, walking with a stoop and talking with a drawl in a language which smacked of Chaucer and the King James Bible.

The long rifle was the law. If your neighbour stole your pig or violated your daughter, you took your squirrel-gun off the mantel and went gunning for him. Family feuds went on into the third and fourth generations: the Hatfields and the Coys exterminated each other. Breathitt County was known through the land as "Bloody Breathitt"; it was indeed a foolhardy stranger who allowed the sun to set on him in the Breathitt mountains.

In later years much, far too much, of the little corn raised on the benches of the hills went into moonshine. On clear afternoons in the fall columns of wood-smoke rose upward from the wooded hills, marking the sites of stills boiling off the mash. Moonshine became a subsistence industry, for the game and the lumber were gone, the soil was thinning out along the branches, and mining was waiting for the railroads. By devious ways the clear, potent juice from the stills found its way to Cincinnati, Atlanta, Nashville, Louisville. It brought in most of the little cash money seen in the mountains. As

These are the accepted implements for harvesting wheat and hay: a scythe and sickles that were made at the village smithy

long as the mountain people made it for home consumption, the Federal Government took only an academic interest in the industry as an illegal venture. But when it began to compete with licensed distillers, the revenue men moved in and an era of raids, sabotage and spying set in. The "revenooers", disguised as itinerant preachers, pedlars, and hardware salesmen, ferreted out the stills, fought pitched battles, and sent those they caught away to jails outside. The long campaign against illicit liquor-making became epic; ballads were written and sung to the accompaniment of the favourite mountain instrument, the guitar. The hero was the one who frustrated the revenooers, hiding his still so skilfully and shooting so straight that he remained free.

These were bad years for the mountain people, in-between years. It was hard then, much harder than when Martha's grandfather could shoot the winter meat in one day on the mountain. Now many of the old arts of self-sufficiency had been lost; no longer would men make the effort to spend weeks at the salt-licks. No longer were young girls willing to sit hour after hour at a loom, weaving the cloth for the family. Those things that must be bought cost more; and the list of things one wanted grew faster than the means to buy them. As the new way of life pushed in from the outside world, the young people became restless and dissatisfied. They went north to the cities, for their home hills offered them less and less. When a cabin burned it was not rebuilt; hillside cornfields went back to briars and weeds. The mountains were losing their people.

Then the railroad came. That was in 1910, and John Back got a job laying track; later, when the mines opened, he became a miner. The hours were long and the pay low, but it did bring in cash, and the family began to have a few luxuries: coffee replaced sassafras tea as a hot beverage and brown cane-sugar took the place of sorghum molasses. Martha remembers her first calico dress—and the first oranges John bought for the children's Christmas.

Martha Back is a Baptist, and an ardent one. Her great-grandfather brought a Bible in his saddlebags when he came north out of Carolina. Religion, as an emotional outlet, is strong in these hills. In the early 1800s a powerful evangelical group of Baptists in North Carolina undertook to bring the Bible to the "heathen" settlers in the Kentucky and Tennessee mountains. This was the Roaring River Baptist Church, and its missionaries prayed and baptized and exhorted their way into every nook and cranny of the mountains. The Baptist Church is predominant, the hard-shell, shouting Baptists who believe in immersion, in hell-fire and brimstone, and infant damnation. The mountain people attend church as people of the cities attend the theatre or the races. It is their recreation, their promise of better things to come. During the annual winter revival-meetings the countryside turns out for an emotional binge seven nights a week, attending meetings in their own and neighbouring churches, walking miles over the mountain trails. They shout, are seized with frenzies, speak in unknown tongues. Preachers are measured by the volume of their exhortations, by the very violence of their appeal. The best are those who leave their audience trembling and terrified at the prospect of an eternity in hell. Many of the great mountain preachers owe their power to their mastery of mass hypnotism. The success of a revival-meeting is measured by the number of mystic seizures and trances.

Martha Back was born in the decline of an old culture and an old way of life. She knew how to deal with the problems of living off scanty acres; she was perfectly adjusted to the life of self-sufficiency which her forbears had developed to a fine art. She was reasonably happy, finding a deep satisfaction in conquering the winter cold, sickness and hunger.

Now the circle has come to a full turn and is closed. When the game which fed the pioneers was exhausted, lumber gave them a brief respite; then the railroads and coal saved them again at the turn of the century. Now the mines are closing, and once more the mountain people face hunger and poverty. The mountains are becoming depopulated—there are more "hill-billies" in the slums of Cincinnati than in all Breathitt County.

But to Martha Back a journey out of the mountains, and a home out of the shadow of the hills which have sheltered her all her life, is unthinkable. She is ill fitted for the new life of juke-box and store-boughten dresses and frozen foods. She accepts her old-age pension cheque, for she must live; but it violates all her age-old principles of self-reliance and independence. That is why Martha Back will never leave her tumble-down mountain home—until she joins her husband in the little cemetery down the branch.

"Song of the Clouds"

by STUART LEGG

A remarkable new film will be seen this month on many British screens. Though the human beings shown in it are divorced from any particular environment, its theme is the geographical one of man-in-his-world, seen as a whole from a standpoint unrealizable before the age of air-travel. The making and meaning of this film are here described by its producer, on whose quarter-century of experience in documentary film production the Shell Film Unit has relied to such superb effect

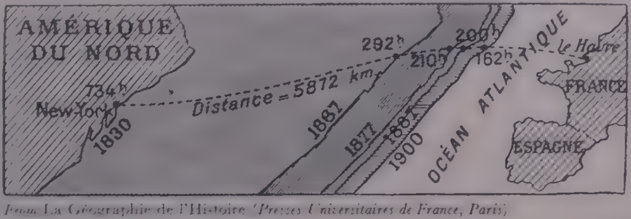
STAND, any day and almost any time, at one of the major international airports—Idlewild or Ciampino or Dum Dum or Santos Dumont—and watch the globe shrink. Tail to nose, one behind the other, the outbound airliners of half the nations of the world pass before you on their growling, rumbling, whistling parade from the tarmac to the runways.

What a spectacle it is! Their names and signs and colours evoke the roster of geography and history at once: K.L.M., S.A.S., B.O.A.C., P.A.A.; *Flying Dutchman* and *Guttorm Viking*, *Cassiopeia* and *Clipper Mermaid;* green of Iraq and Pakistan, blue of France and Iceland, red of Australia and India, multi-blazoned splendour of the Lion of Judah. Silver hulls gleaming, propellors flashing, jet-streams shimmering, great rudders gently undulating as they roll along the concrete. And as the procession moves forward, a stream of verbiage, sputtering over the radio from the watching control-towers, follows it. ". . . Hotel Foxtrot, your traffic is Stinson now on final and DC3 leaving pattern on outbound heading for 180 degrees . . ." ". . . Gulf Foxtrot November, you're clear to taxi to runway two five left by taxiway Charley and runway one three left; the wind is south-west at one two . . ." Seeming nonsense: in fact, minute instructions for entering the aerial highways waiting above. They turn into the runways, wingtips describing sweeping arcs. Then brakes grip wheels; they come to a stop, and the whirling circles of light along the wings intensify as the engines are run up one by one for test.

The thunder dies; and still they stand motionless, poised as it were to gather strength for the final rush into the air. Why the delay? Something wrong? No; in the cockpits, a last ceremonial of care is taking place. The Captain turns from the controls: "Before take-off check, please." With the impatient engines throbbing on outside, the First Officer's pencil begins to skim down the form across his knee; and the cockpit fills with a staccato snap of question and answer, bandied back and forth between the crew. "Auto-feathering?" "On, green light on." "Alternators?" "Pre-set on voltage normal." "Propellor pitch?" "Fully fine." "Mixture control?" "Rich, lock on." "Fuel valves?" "Checked tank to engine." "Booster pumps?" "On, normal." "Generators?" "All on." "Ignition switches?" "Checked on both." "Controls and trim tabs?" "Controls are free." "Ready for take-off, sir." The Captain settles in his seat. "Right. Stand by for take-off . . ."

And then it comes: the practised pressure on the throttles, the answering bellow from the engines, the gauge needles surging up in concert, the airframe shuddering behind the vibrant power, the runway lights streaming past ever faster, the face thrust forward in excitement to a cabin window, the gentle pressure beneath chair and lap-strap—and suddenly airport and city and surrounding hills are parts of a well-arranged model, of a world dwindling in scale, shrinking to a toy.

You may remember the intriguing map by Brunhès and Vallaux in their *Géographie de l'Histoire* showing that, with the speeding up of seaborne transport, the Atlantic had diminished, by 1900, to about a quarter of its width in 1830. In 1957, and in terms of air transport, the shrinking process is accelerating more and more swiftly. London is now little more than 12 hours from New



From La Géographie de l'Histoire *(Presses Universitaires de France, Paris)*

Brenard Press, Ltd

"*The miracle of the shrinking globe is done . . . with machines intrinsically beautiful*"

York; and soon, with long-distance turbine-driven passenger aircraft, the figure will be halved again. And the shrinkage has applied not only to the North Atlantic, but to a great part of the globe including the Pole. Thanks to those processions at the international airports, no two places on earth, and no two people alive today, are now more than two days' journey from each other.

This is true, and not true; for truth, as an Englishman once remarked, is spherical. And without severe qualification the statement can easily rank among the silly sayings of the century. The quickening beat of maritime steam did not apply to the Indian peasant or, for that matter, to the Bowery bum. Nor does the rising whine of the gas-turbine. And even if you belong to the potentially affected category, a number of conditions attach. *If* the two places chosen are both reasonably accessible; *if* you can satisfy inquisitive officials all along the route that your person is innocent of disease, your belongings of contraband, and your politics of agin-manship; and *if* you can produce a thick wad of banknotes (thinner now that Tourist fares are becoming universal)—*then* the airlines will do the rest. But note that the 'ifs' are political and economic, not scientific and technological. If the ground will allow, the air can do it.

How is the miracle performed? For when all the conditions are attached and all the qualifications made, a miracle it still remains. And even if the shrinking of the world holds good only for a limited few today, its implications for tomorrow are boundless. The new freedom of the air is making a fool of the old restrictions of the ground; and inevitably, sooner or later, the latter will give way. In making the film "Song of the Clouds" we set out to answer this question, first for ourselves, and now that the film is finished, we hope for you too when you see it.

The background to the film is quickly sketched. Two years ago, the International Air Transport Association—the 'trade association' of the world's airlines—put a suggestion to Shell: would the Company consider having the Shell Film Unit produce a picture on the broad theme of "the air in the service of mankind"? The idea blended with existing projects; and scripting was

By courtesy of Pakistan International Airlines Corporation

"In a world moving across frontiers at anything from 250 to 700 m.p.h., nationalism had better have no place." Passengers and stewards, aircrews and ground-staffs form a new international community

By courtesy of B.O.A.C.

initiated forthwith. The plan of production, like the subject itself, was global. The main body of the shooting would be executed by a unit of four, travelling round the world as fare-paying passengers, and stopping off at important points. The director, John Armstrong, would be British; the cameraman, Edward van der Enden, Dutch.

The mapping of their route was a complex business. Considerations included: weather conditions likely to be met; choice of flights and stopping-points to secure maximum variety of geographical interest and air operation; a time-schedule which would ensure completion of a major documentary film within a year. The itinerary finally settled took the unit from Britain to North, Central and South America; across the Pacific via Honolulu to Japan; thence across India to the Middle East; and home through continental Europe. Meanwhile, a second unit from London would visit West Africa; Shell film units in Venezuela, Egypt, India and Australia would contribute material from other locations off the main route; and supplementary shooting would be obtained as well from Arctic Canada, South Africa and Ethiopia. Thus the world outside the Sino-Soviet sphere would be pretty well covered. I.A.T.A. notified more than seventy of their member airlines that their co-operation might be needed; and I.C.A.O.—the International Civil Aviation Organization—sought facilities from the many governments with which they are linked through the United Nations. Shell companies all along the route stood by to 'refuel' the unit and speed them on their way.

The unit found themselves in some unfamiliar spots: poised above the yawning mouth of Popocatepetl; shooting the glistening peaks of the Peruvian Andes at sub-zero temperatures, hampered by oxygen masks; riding out a four-day storm in an Atlantic weather-ship; sweltering on the runways at Bombay. Surrounded by the superb organization of the air, 'adventures' in the sense of travellers' tales were few and far between. There were, of course, *brouhahas* with the old world of the ground; in one country—let it be nameless—with a high reputation for modern up-and-doing, ten days' pleading with the Customs to release the camera gear availed nothing, and its progressive air-mindedness had perforce to go unrecorded. But for Armstrong and his men it was, for

"The new freedom of the air is making a fool of the old restrictions of the ground." Can elephants fly? Yes: air transport can now be arranged from almost anywhere to anywhere on one airway-bill

tesy of B.O.A.C.

By courtesy of

Edinburgh, September 1956: the 12th Annual General Meeting of the International Air Transport Association, in which by patient conference the world's airlines attain harmonious collaboration

the most part, a seemingly endless succession of working spells aloft in transit, punctuated by equally intensive working sessions below. It is no joke beating one's brains to impose an ever-fresh viewpoint on new scenes for five months running; striving at the same time to secure colour-photography of the highest standard under strange conditions, with results unseen and reported only in cables from home. With little time and much money at stake, the strain on director and cameraman is considerable. In international film-production, with its ceaseless snakes-and-ladders of exigencies and intangibles, there are unhappy films and happy: those in whose making so many things go wrong that you wonder what can possibly be left to go wrong next; and those where all goes so ominously well that you wonder what calamity is in store. "Song of the Clouds", thanks to the chain of help all round the earth—from airline managements, aircrews, ground staffs, passengers and, yes, inquisitive officials—was, *laus Deo*, among the latter. By the time they returned, the unit had covered 75,000 miles and put in more than 250 hours of operational flying—without serious mishap of any sort. They had shot, allowing for by-product films to be subsequently made, about 50,000 feet of Eastmancolor. And they had discovered, and now sought to reveal in the editing of the picture, how the miracle of the shrinking globe is done.

The story, undoubtedly, begins with the scientists and the pioneers. Because the Wright brothers achieved a height of nine feet one gusty December morning at Kitty Hawk, the rest followed on. But in this film we took the original brilliance and the early daring for granted. For what makes most modern miracles effective is the organization of these qualities into everyday routine. And to organize an international airline (let alone the seventy-five or so which exist today) you start with a world designed for caravans and sailing-ships. In trying to set common codes of practice and procedure—the basis of speed and safety in the air—you are faced with baffling diversity on each side of the frontiers beneath: differences of approach to fares and rates, timetables and services, law and language, currency and catering, training and technics and taxation.

C.O.I., Crown copyright

"There's nothing to it really, is there?" So says the innocent passenger, after an uneventful flight and a smooth landing. But in fact this routine performance has only been achieved by the delicate, unobtrusive coordination of many complex scientific operations, carried out by highly trained personnel. Taking its place in a moving continuous queue, the incoming aircraft has been brought down by stages with an interval of not less than three miles between it and its successor. At every stage its movements have been watched and regulated and recorded on a ticker-tape for the mutual information of the various controllers concerned. At London Airport there are some twenty-six tape-machines. Here, seated before one of them, is the ultimate controller: the Face Supervisor (Marshalling), who controls all the aircraft on the 'apron' where passengers embark and disembark: 2,500,000 of them a year, carried on 90,000 separate flights by thirty-five airlines of twenty-seven different countries

In the raw and before the event, the song of the clouds sounds like a series of emphatic discords. Yet it has been made harmonious; not by some omnivalent (and hence valueless) ukase, but by process of patient conference urged to agreement by the realities of competitive enterprise. The international collaboration of which the United Nations talk and hope has in fact been achieved by their commercial airmen. The result? One ticket takes you round the world on a score of airlines of your own choice; one baggage-check does the same for your suitcase; one airway-bill lifts your freight to anywhere, be it a dozen oysters or a ponderous crankshaft for a diesel engine.

Having given your airline freedom of manoeuvre, you must now create a new kind of man and woman to staff it. Sound training in the technology of the sky, itself increasingly involved, will not alone suffice. For in a world moving across frontiers at anything from 250 to 700 m.p.h., nationalism had better have no place. As one air official put it: you have to make sure that a perfect landing will be made when an Indonesian pilot is flying a British-built aircraft into a Ceylonese airport on a French-designed landing-aid controlled by a Greek. You have to make sure, too, that the stewardess, having remembered not to serve roast pork to the mullah in Seat 28, will also recall that it is Friday before offering it to the Franciscan monk beside him.

And having set this new race of international men and women in the sky, you have to see to it that they will never be unsupported there. You have to encircle the earth with approximately eighty-five weather-stations and ships ceaselessly reporting, assessing, interpreting, collating their observations; and passing them back, sometimes through half-a-dozen languages, to the cockpit where they are needed. You have to girdle the globe with systems of telecommunication, traffic control, electronic aids to navigation. You have to see that the maintenance shops always have adequate stocks of spares for every type of aircraft in your fleet; that every plane undergoes on the dot its visual checks, terminal transit checks, rated checks, and all the other periodic checks; and that when any plane goes in for any of them, another is available to replace it in service.

And you have to think furiously of the future—for in the air today and tomorrow are so close together that there is little distinction between them: of new methods of handling traffic in a sky where speeds are constantly increasing, and space is in growing demand for feeder lines and helicopter services; of new ideas, like vertical take-off and tilting wings, to get your payload into the air quicker and keep it there longer; of the development of new routes; of which among the forthcoming aircraft—the Britannia or the DC8, the Boeing 707, the Comet or the Caravelle—will serve your purpose best, and of where the money to buy them is to come from. You have to think—but by this time you have a headache.

As all this came together on the screen, I began to see how the miracle is done. If I get it right, there is nothing specially miraculous in the individual doing, but rather in the collective, scarcely-realized result. The doing is the plodding resolution of diversity: the result, the spectacular reduction of time in space. But it is done with machines intrinsically beautiful; by people whose business is not only to be supremely competent but bright and colourful as well; to an end which affords a new vision of physical and human geography. That is the stuff that films are made of.

And as I sat in the screening-room and watched the silver monsters taking on their loads, I began in my mind's eye to compose a passenger-list not of ordinary mortals like you and me, but of V.I.P.s of this world of distance that has now been shrivelled. Red-headed Norsemen would be going up the gangway, olive-dark Spaniards and Italians, burly Portuguese. From her alphabetical list, the stewardess would tick off in succession: Cartier, Jacques; Colombo, Cristoforo; Cook, Captain James, R.N.; Diaz, Bartolomeo; Ericsson, Lief; Gilbert, Sir Humphrey; Livingstone, David; Magellan, Ferdinand; Orellano, Francisco de; Peary, Rear-Admiral Robert, U.S.N.; Polo, Messer M. Soon after, cruising at 18,000 feet or so, sipping an admirable hock and dealing with the *sole bonne femme*, looking down on the tremendous landscapes whose former contours they knew so well—and now revealed in the breath-taking shots, brought back by Armstrong and van der Enden, of San Salvador and Macchu Picchu, of Lake Tana and the Cape, of the glittering serpent of Irrawaddy gliding through the eastern jungles—what would they think? I suspect that their conversation would be as quietly objective, as dispassionately technical, as that of their successors on the flight-deck in front of them. But I leave the speculation to you—when you see the film.

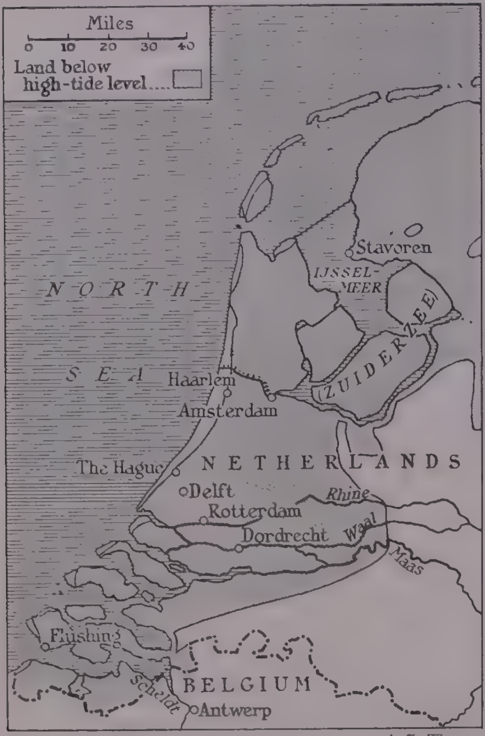
The Delta Plan: Holland's Next Offensive

by JOHN SEYMOUR

The Dutch, whose achievements in their secular battle against the sea are well known to our readers, now plan a new undertaking, beside which "the enclosing of the Zuiderzee was child's play". The author observed the beginnings of this from his yacht Jenny III, *in which he and his wife traversed Holland subsequent to the journey described in his latest book* Sailing through England

The delta in question is that collection of flat islands which lies to the south of Rotterdam and to the north of Flushing and Antwerp. It is not strictly a delta, but a marine deposit of clay and sand left over by the receding Ice Age. Tide and wind drove sand from the bed of the North Sea to form a straight line of dunes along the coast of what is now Zeeland and South Holland, so that the rivers Maas, Scheldt and Rhine had to force their ways through the muddy shoals behind these dunes to the sea.

Before the intervention of man this was an unstable country. Rivers, tidal estuaries, islands, peat-bogs, saltings and marshes were formed by the elements, only to vanish in due course and be replaced by something else: created and then destroyed by the constant warring of wind, waves, tide and fresh-water currents coming down the rivers.



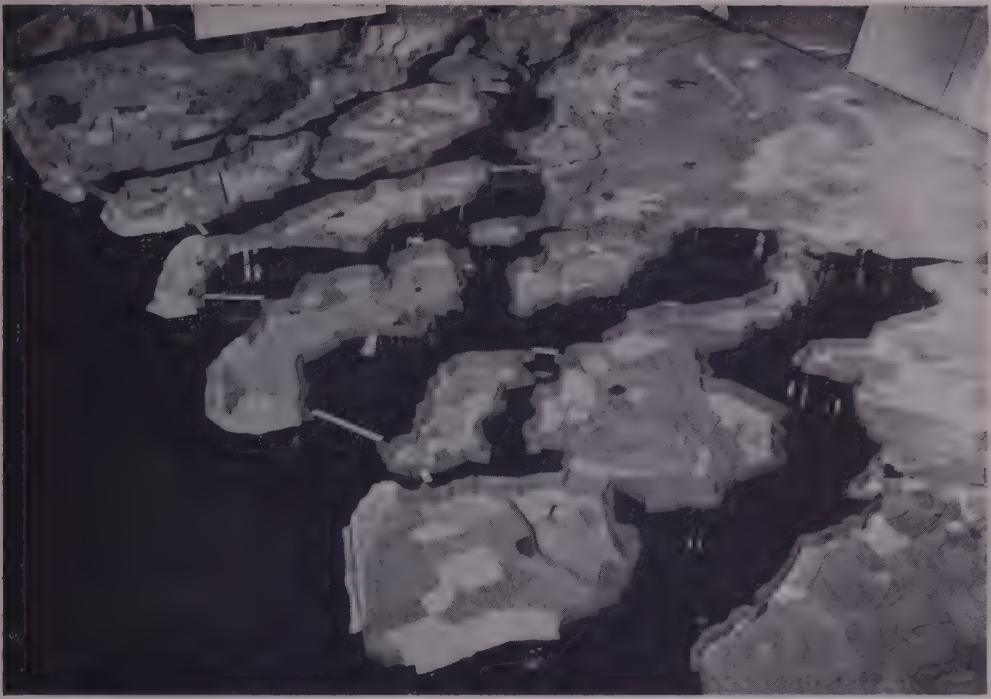
A. J. Thornton

With the invention of the dyke, or sea-wall, man stabilized the situation. The ancestors of the present-day Dutchmen built dykes around the drier parts of the morass to keep the sea and river-water out and preserve, as it were, the geographic *status quo*. The dyke was only made possible by another invention: the sluice-gate. The land newly formed was above low tide but below high tide. There had to be self-opening and closing gates in the dykes to keep the high tide out but allow the drainage-water to escape to the sea at low tide.

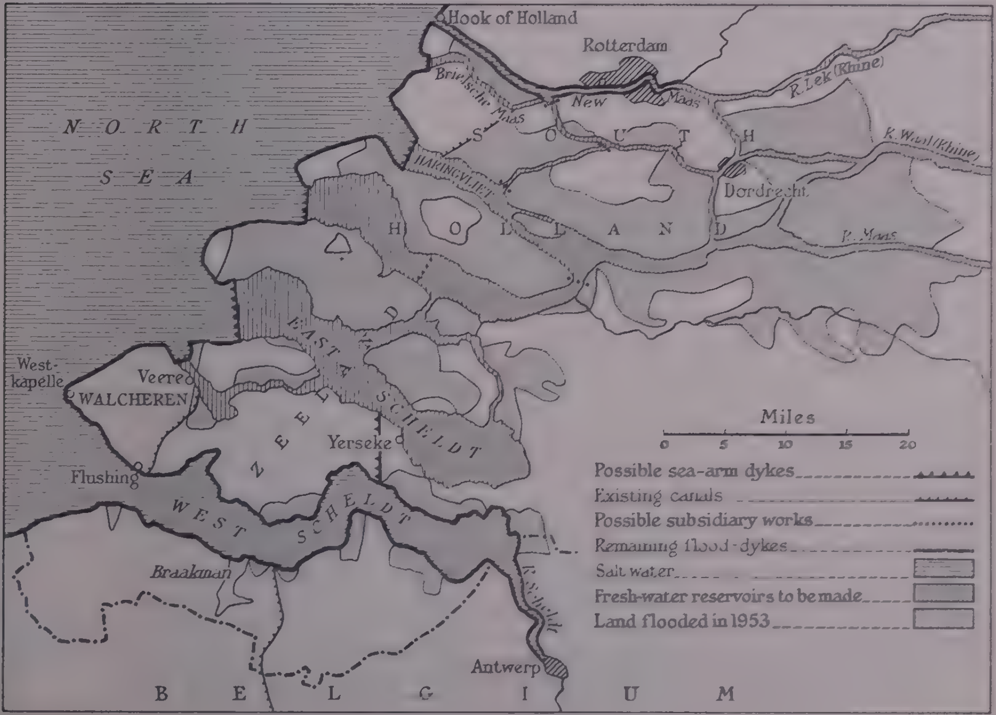
The hydraulic forces which had worked to change the shape of the landscape before man's intervention continued to exert themselves, but most of the time they were held in check by man. It was not sufficient of course just to make the dykes: they had to be defended. In war it is useless putting up obstacles, such as barbed wire, unless you can 'cover' it with gunfire. It is useless setting up obstacles against the sea unless you are prepared to defend them—for ever.

Most of the time the elements were held in check. It was recorded by priests living at the time that during the night of December 14, 1287, the sea broke in and drowned 50,000 people between Stavoren and the Ems. The Zuiderzee was formed, despite man's efforts to prevent it, in the 13th century. The place which used to be known as "Holland", or the Great Hollandse Waard, was totally destroyed on the night of November 18, 1421, complete with sixty-five villages and an estimated 10,000 people. The land lost there has never been reclaimed.

Most of the below-sea areas of Holland have been repeatedly recaptured by the sea, and reclaimed again by indomitable Dutch-



(Above) *A model of the proposed Delta Plan, showing how the sea-inlets will be dammed. So that ships can reach Flushing and Antwerp the West Scheldt (on the right; see map* below, *will not be closed. Dykes around the islands are to be kept, since the land will still be below water-level*



A. J. Thornton

men. Truly the Dutch have fought for their country, and not only against Romans, Vikings, Spaniards and Germans. The sea has been their most persistent enemy.

Their fight has generally taken the form of the attempt to shorten their coastline. The shorter they can make it, of course, the easier it is to defend. The great straight line of coastal sand-dunes is always their first line of defence, and without it Holland would not exist. But the rivers and the sea have made many gaps in this barrier and it is against these infiltrating attacks that the Dutch have had to build their dykes. The more, then, that they can shorten their coastline, and bring it into line with the straight, strong line of coastal sand-dunes, the less the mileage of vulnerable mud-dykes they will have to worry about—and the less likely the need for such acts as that allegedly performed by the little hole-stopping Dutch boy whom we all learnt about at school.

It is thought that the first salt-water dykes in the Netherlands had a total length of 1500 miles. By the year 1840 this had been shortened to 1230 miles. By 1930 the figure had been reduced to 1030 miles. The enclosing of the Zuiderzee in 1932 shortened it to 840 miles and the odd forty have since been lopped off by the enclosing of two inlets: the Brielse Maas and the Braakman.

For many years some Dutchmen had dreamt of the then impossibly ambitious plan of damming in the Zeeland estuaries. "Waterstaat", that state within a state in Holland, the department of government responsible for the control of water, started the fantastically complicated tidal calculations and other research into the idea in 1935 and, after eighteen years of hard work, ordered its engineers to submit a report on whether the work would be possible, on December 2, 1952.

It was as though the sea had had intelligence of its enemy's intentions. Two months afterwards, on the last night of January 1953 and the morning of the next day, came the flood and the storm which tore great inroads into the mighty sand-dune defence itself, made sixty-seven tidal gaps in the dykes behind it, and came within *a few inches* of flooding Randstad Holland—that part of the low country containing the cities of Amsterdam, Rotterdam, Dordrecht, Haarlem and the Hague, to mention but a few.

Either the shores of the North Sea are sinking, or else the level of the sea is rising. Or both. Estimates vary around a quarter of a metre to a metre every hundred years. This may be due to the 'continental tilt', or to the progressive melting of the ice-caps. Parts of Holland are now nearly thirty feet below *mean sea-level.* Such a country must become progressively harder to defend.

Either the Dutch must greatly strengthen and heighten their existing mileage of dykes, or else they must drastically shorten their coastline by damming off more sea-inlets.

To heighten the dykes, with modern earth-moving equipment, is easy enough. But to do so is to build on poor foundations. Some of the dykes are on unstable soil, some are subject to tide and wave erosion. What the Dutch call land-slides are constantly happening to the dykes of Zeeland: the tide scours away the footing of mud and saltings against the dykes until the latter collapse and let the sea in. The engineers of Waterstaat claim that it would be not much more expensive to dam the sea-inlets than to strengthen sufficiently the existing dykes. And they claim that the former course has other advantages.

The first of these is to provide a reservoir for fresh water.

With the replacement of the wooden windmill by diesel and electrically driven pumps, drainage has been improved in the lower parts of Holland. Water can be pumped up from the low-lying fields into the higher canals, between their banks, and then from the canals up into the sea itself. For much of Holland is now below even low-water mark. The lowering of the water-table has had an unexpected result. The peat subsoil, drying out, has shrunk. Whole countrysides have subsided for several metres. The insidious sea has infiltrated through the underground strata to take the place of the evacuated fresh water. By osmosis the brine rises to the surface, the water evaporates, the salt remains. Crops wither and die.

The only cure known for this is irrigation with fresh water. Fresh water must be run onto the fields to leach out the salt, and then be carried away by the drainage system and pumped up into the sea.

It was partly in an attempt to obtain enough fresh water for this purpose, and also to keep the salt sea at—as it were—arm's length that the Zuiderzee was dammed, and turned into the fresh-water IJsselmeer. This has arrested the salting menace in North Holland. But now something similar is needed in South Holland. If the Zeeland estuaries are dammed from the sea, and allowed to fill with fresh water from the Rhine and the Maas, an enormous reservoir of fresh water will be created.

A third advantage that is argued for the projected Delta Plan is improvement of land transport. All the Zeeland islands will be joined by roads and, if required, railways. The islands will, to all intents and purposes, become part of the mainland.

A fourth advantage is improvement of water transport.

The water traffic between Antwerp and the Rhine, which all goes through the Zeeland estuaries, has to be seen to be believed. I sailed last winter up and down these estuaries, in the company of *thousands* of craft: a constant procession, both ways, of enormously long Rhine barges, some of them carrying 3000 tons of cargo, some with their own engines, some pulled by tugs, river tankers, small trading *tchalks*, little barges. I also saw these estuaries when no vessel could move on them with safety. The fierce tides, when the wind is against them and blowing a gale, send up such large waves that the long Rhine barges would break their backs if they attempted to weather them. The immensely important traffic between Belgium and the Rhine is held up.

The Belgians have for some time been trying to persuade the Dutch to allow them to dig an inland canal through Dutch territory from Antwerp to the Rhine. The Dutch have so far failed to grant this permission, but they now counter by saying that, when the Delta Plan is put into effect, the estuaries will be freed from the tides, will be cut off from the sea, and will be navigable in all weathers.

I have heard opponents of the Plan say that when the water is fresh, and non-tidal, ice will form on it more easily and block the traffic; also that it will be impossible to make provision for the voiding to the sea of the enormous masses of ice that come down the Rhine.

The engineers counter this by saying that the big sluices which they intend to make in the dam across the Haringvliet, and the fact that they are not intending to put a dam across the New Waterway which runs past Rotterdam, will allow the floating ice to get away; and that they intend to create an ice-breaking fleet capable of dealing with any ice which forms on the new fresh water.

There are many arguments against the Delta Plan.

A minority of the residents of Zeeland do not like it because they say that it will spoil the distinctive charm and culture of their islands. All the Zeelanders that I met are singularly unworried by the threat of the sea: even the ones who lost their homes and their kith and kin in the last floods. "We have always lived under the threat of the sea," they say. "We are used to it." But many of them do not like the idea of the Zeeland islands becoming merely another part of Holland. They still have their own language, quite distinct from metropolitan Dutch, their own costume, quite distinct from that worn by the people who pose for camera-carrying tourists on Marken and Volendam, their own customs and traditions. What is going to happen to them when hordes of cyclists stream down from Rotterdam, and tourists in motor-cars cover the landscape? "Our island will be all mosquitoes and Belgians!" said one resident of Walcheren to me. But the pro-planners say that the Zeelanders are so conservative, such staunch Calvinists, and so—I have heard one of them say—"pig-headed" that all the cyclists and motorists and Belgians in the world would not make them alter their ways one jot!

A strong argument against the Plan is raised by the fishermen. Before the Zuiderzee was dammed it was fished by a numerous fleet of small sailing-vessels, which caught a large aggregate amount of fish from it, but which were owned mostly by poor and not highly articulate fishermen.

One of the Zeeland estuaries, the East Scheldt, is not so much fished as farmed by a highly organized community of educated, wealthy, articulate and politically active men.

The East Scheldt oyster and mussel industry is something unique in the world. The tides from the sea rush up the estuary, crossing sufficient sand-bars and mud-banks to cause them to drop any silt that they have in suspension as they do so. By the time that they get to the mussel-beds near Yerseke their water is completely clean, and mussels placed on the bottom there to clean and fatten will be completely free from grit in a fortnight or three weeks. Mussels are sent to Yerseke from many parts of North Holland and Germany, simply put down in the water for a few weeks, and then exported to various parts of Europe. Most of the mussels eaten in England come from the East Scheldt.

The tides, scouring up the estuary, slacken politely before they get to the top of it, and thereafter move in a circular manner. They bring fresh food to the oyster-beds, but they do not take away, indefinitely, the floating spat or spawn. They carry it gently round until it falls again not far from where it originated, and settles on suitable bedding-material put there for the purpose.

Yerseke supports an export industry worth just under £1,000,000 a year to Holland. The shell-fish farmers there have been tireless in their lobbying of Members of Parliament and in putting propaganda to the country to oppose the Delta Plan. Some of them say that the Plan is unnecessary; others that it should be carried out but that the East Scheldt should not be dammed but should be left open to the sea as it is now. Yet others contend that it should be dammed, but by a dam with sluices in it, which should only be closed during dangerous storm-tides.

The engineers have searched hard for an alternative site for the oyster and mussel industries, but, on their own admission, without success. They talk of giving the oystermen deep-sea trawlers, but as one of the latter said to me: "We don't *want* deep-sea trawlers! We are not fishermen—we are businessmen. We are farmers if you like. We wouldn't know what to *do* with trawlers. We are not like the old Zuiderzee fishermen."

It looks as though the shell-fish industry will simply have to be a sacrifice that Holland must make for its security and survival.

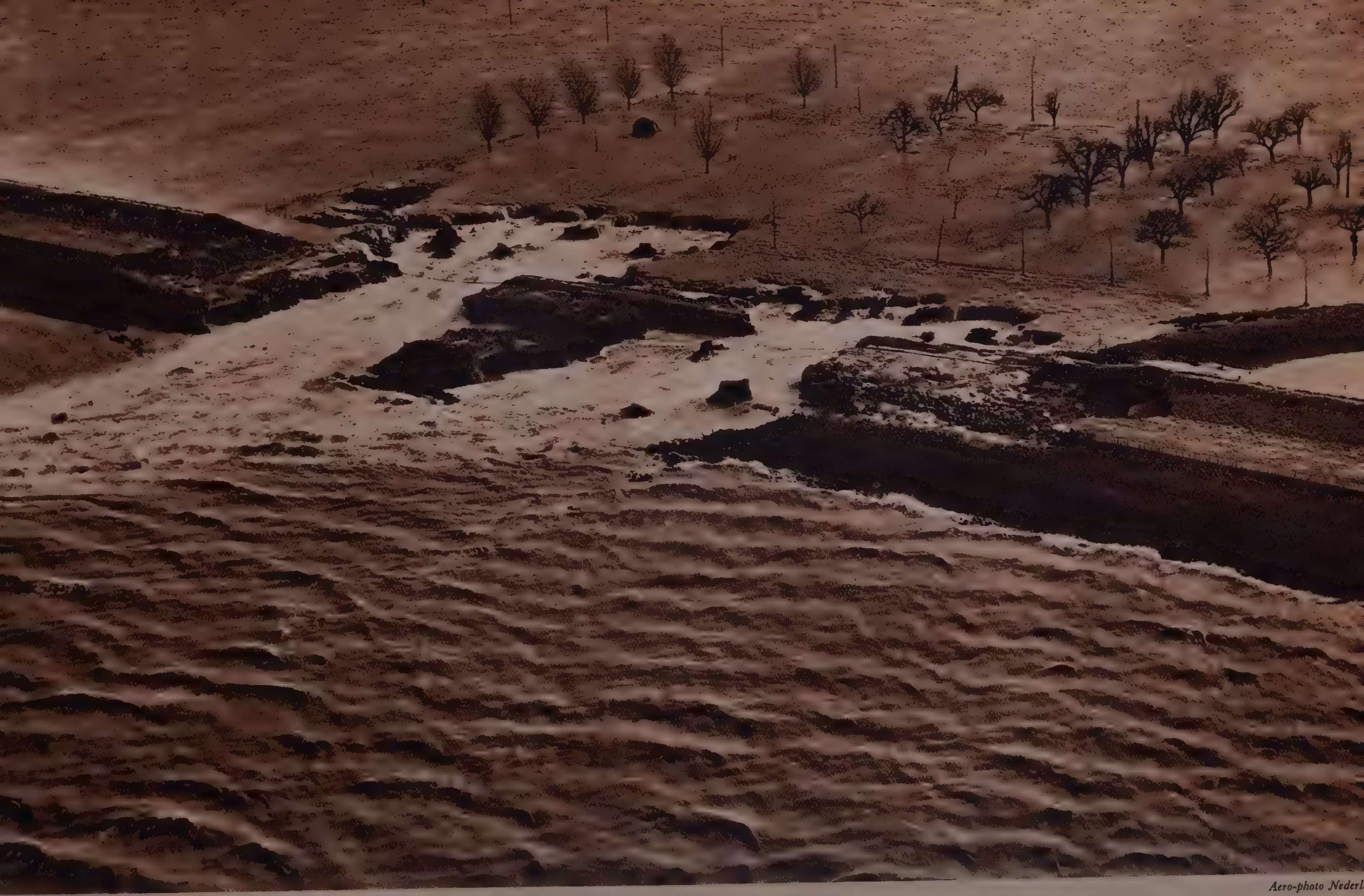
As for the nature of the problem of implementing the Delta Plan: it is an immense undertaking. The enclosing of the Zuiderzee was child's play beside it.

The total length of sea-dams will be a little less than the twenty miles of the Zuiderzee dam. But, whereas the latter was built upon boulder clay under the sea-bed, the Zeeland dams will be built upon shifting sand. Whereas the Zuiderzee had a tidal rise and fall of three feet or so, Zeeland has a rise and fall of thirteen feet. I have seen the tide sluicing so fast down the Veeregat that big channel-marking buoys were pulled right under so that they were invisible! Whereas the mouth of the Zuiderzee was shallow, the mouths of the Zeeland estuaries are, in places, a hundred feet deep. To build a dam exposed to the full force of the North Sea waves, on shifting sand, with ferocious tidal action, in

The sea-wall at Westkapelle fills a gap in Holland's sand-dune defence against the North Sea. Maintained at great expense, it will still be vitally important after the completion of the Delta Plan. The dyke, which was breached by the R.A.F. during the war, is of immense size and strength

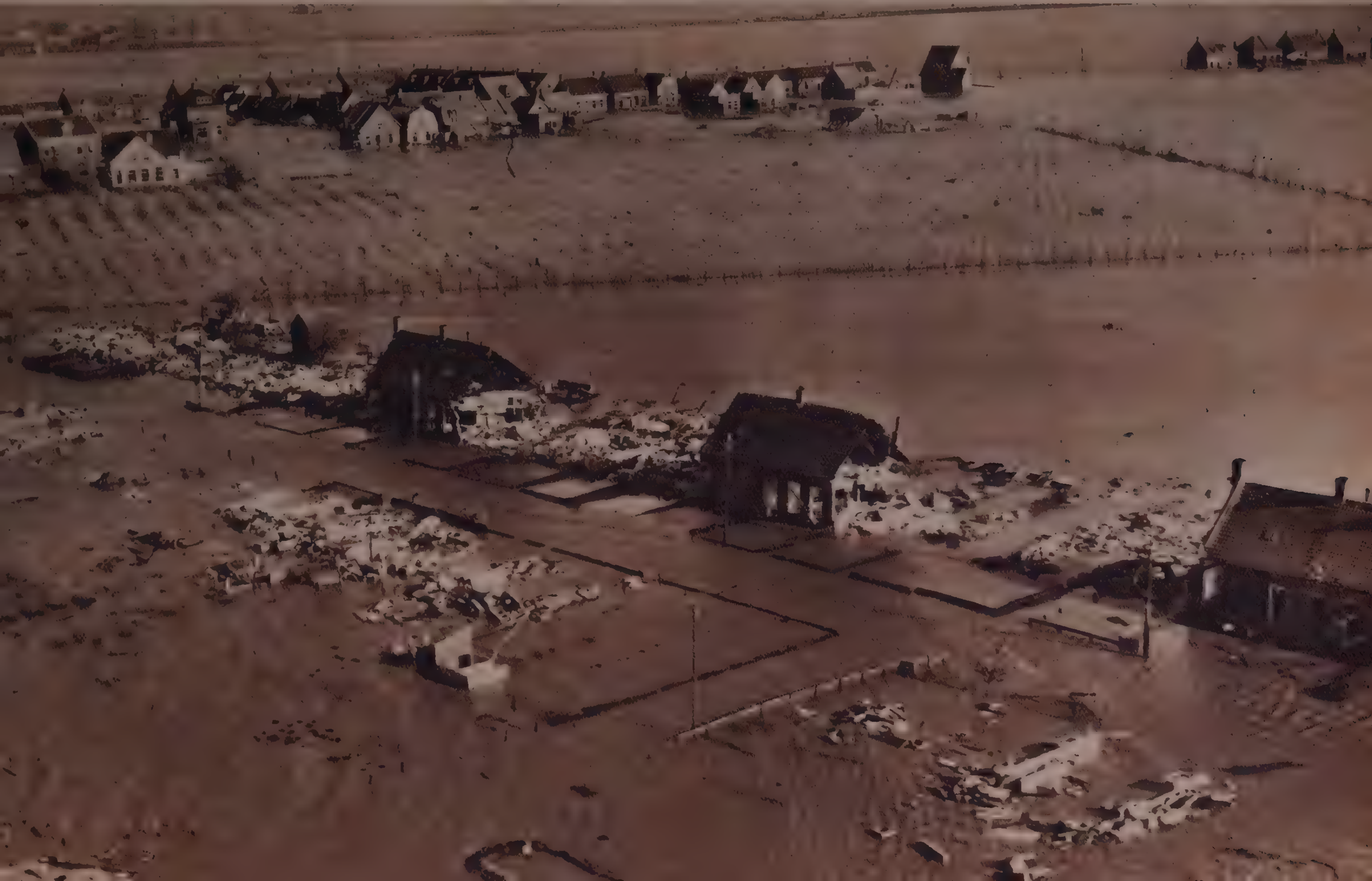
Seymour

Holland has 800 miles of salt-water dykes to maintain, at high cost, as a defence against the sea. If these dykes can be reduced in length, so much the better. The Delta Plan has been devised to do this by damming most of the sea-inlets of Zeeland and South Holland, thus forming fresh-water reservoirs behind the new dykes. To allow free access between the Port of Rotterdam and the sea the New Maas River, here illustrated, will not be dammed. One advantage of the Plan is that the water on which thousands of great barges ply between the Rhine and the Scheldt will be free from tides; at present the Zeeland estuaries are often too rough for them to put out. Another advantage is that when the salt water has been replaced by fresh in the reservoirs it will be possible to arrest the salting of agricultural land



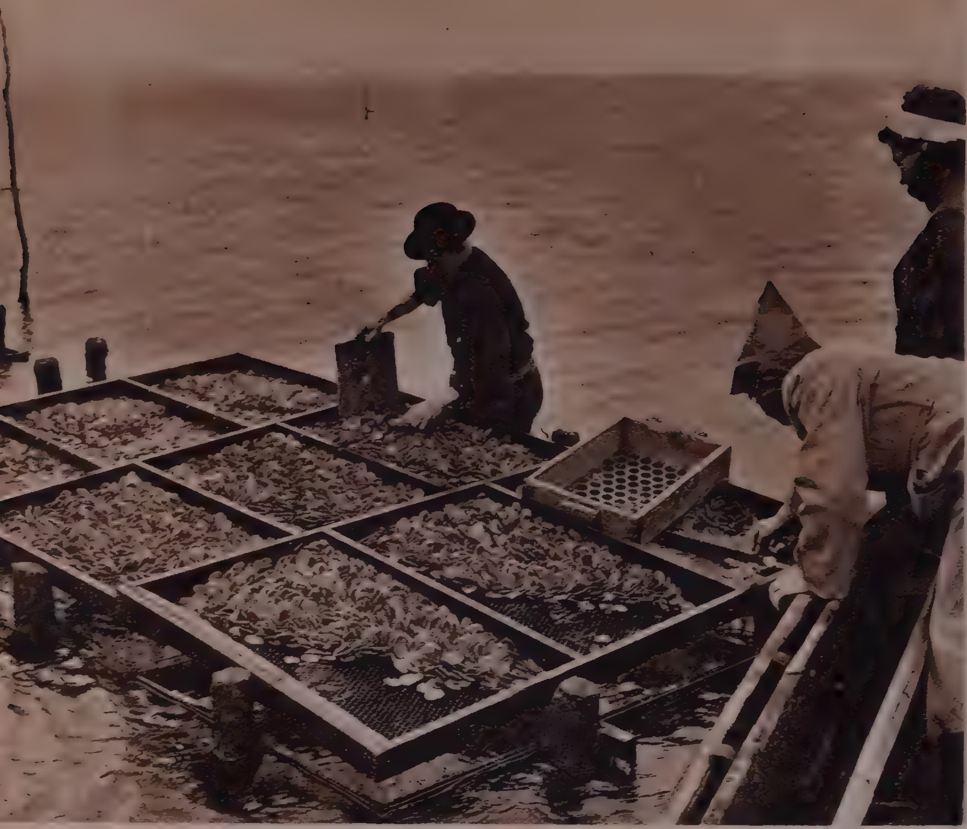
Aero-photo Nederl

The main reason for the Delta Plan: one of the sixty-seven tidal gaps broken into the sea-walls of Holland by the disastrous 1953 floods. The water is rushing out of the gap, following the falling tide. The Plan will reduce by two-thirds the length of dykes to be defended in the Zeeland region



1953: 1795 people drowned; 2500 houses completely destroyed and tens of thousands damaged; 21,000 cattle and 2300 Zeeland horses lost; machinery, food-stocks, furniture ruined; 375,000 acres of land flooded and poisoned with salt. No wonder the Dutch want to shorten their vulnerable coastline

Aero-photo Nederla



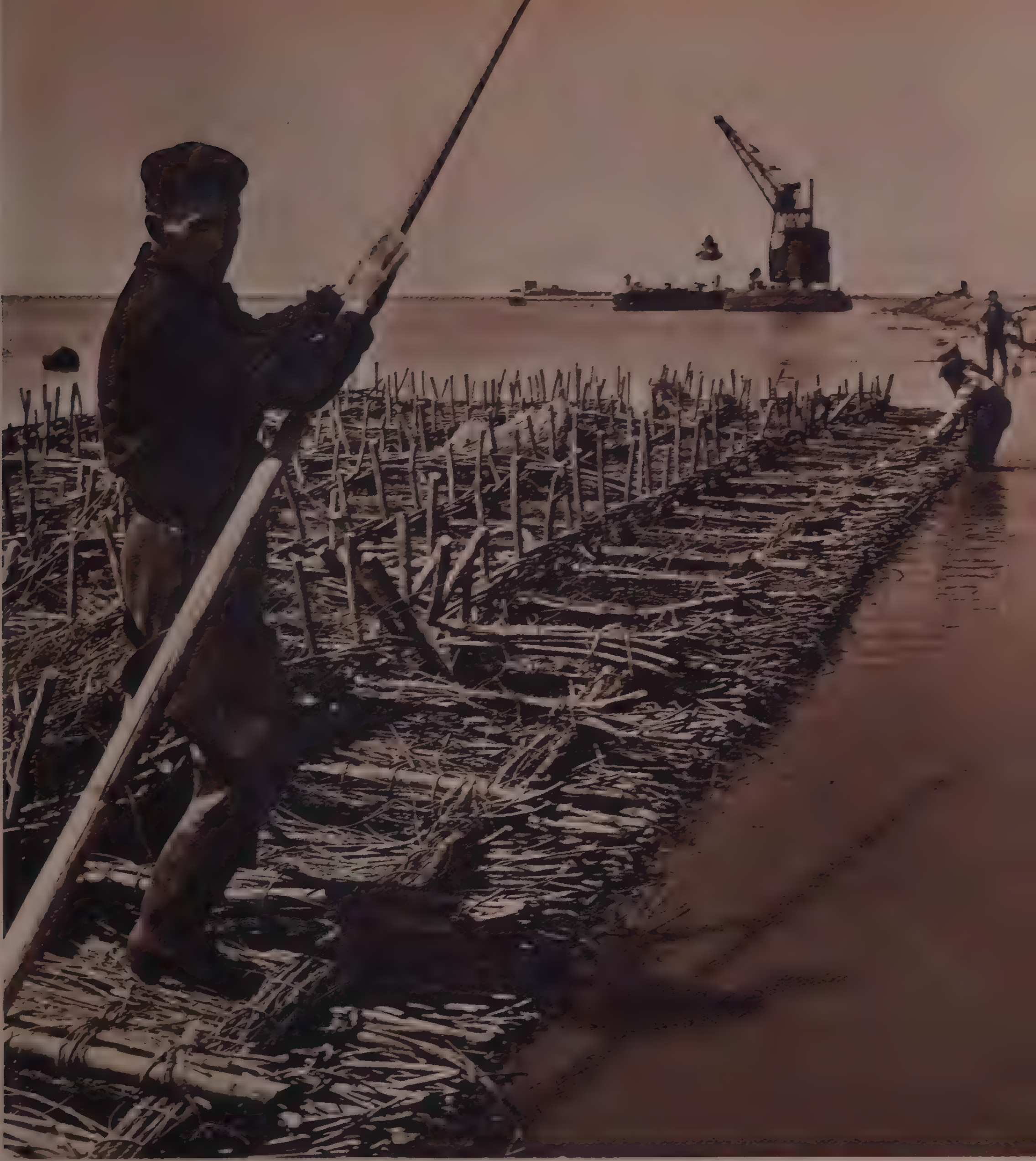
epo", Amsterdam

John Seymou

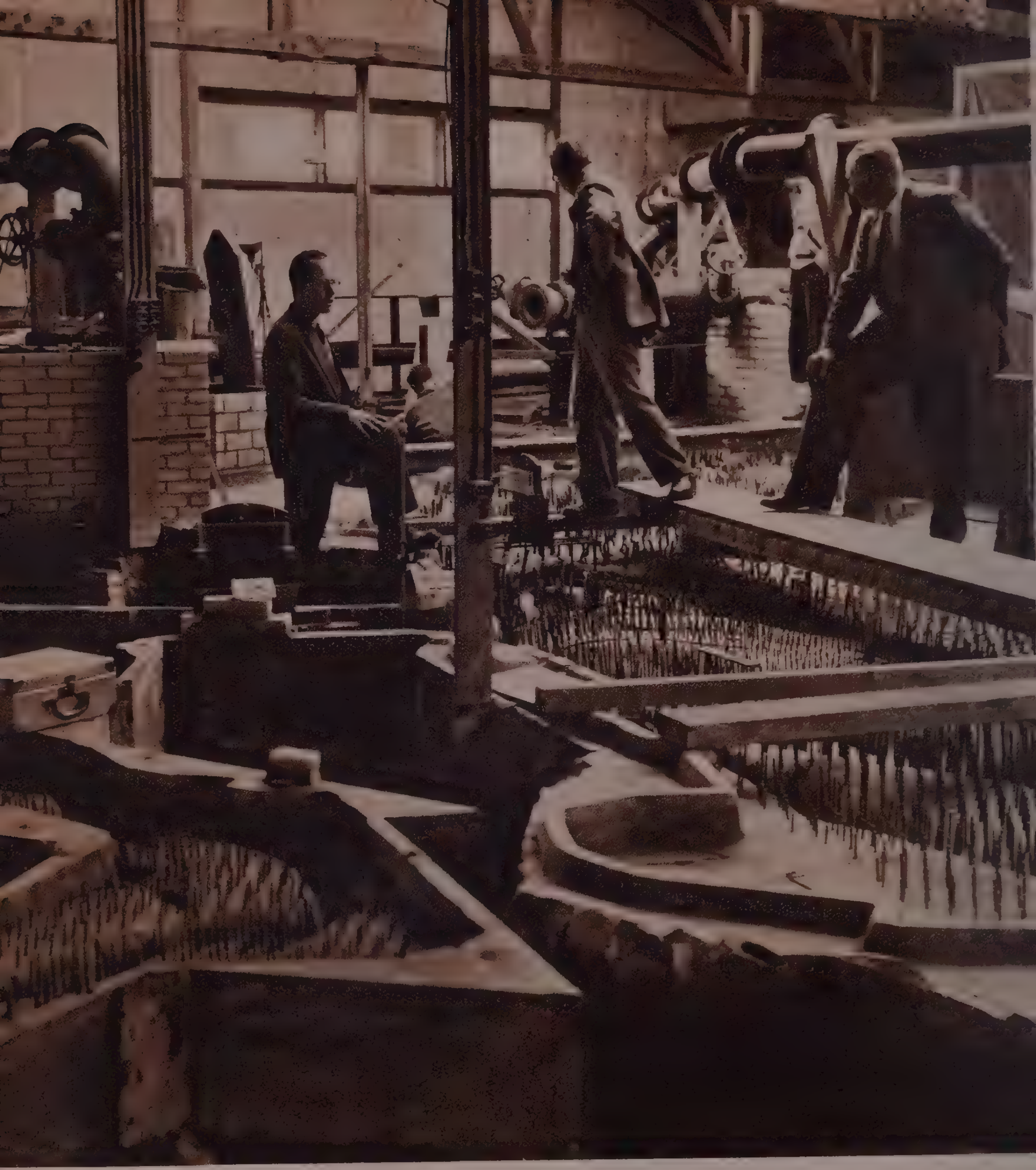
Among the opponents of the Plan are the oyster-farmers of Yerseke (above) *and the shrimp-fishermen of Veere* (right). *They claim that their industries will be ruined. The clear waters of the Eastern Scheldt are the best in the world for fattening and breeding oysters and cleaning mussels. The circular route of the tidal currents brings oyster spat to fall again whence it derived. The Yerseke oystermen claim that no other place in North Europe would be suitable for their £1,000,000 export industry. The Delta Plan engineers are searching for alternative grounds but have not found anything equivalent. The fishermen suggest that the East Scheldt should be left open to the sea, even if the other sea-arms are closed. For technical reasons the engineers wish to close the lot, and say that the fishing industries will have to be sacrificed*

By courtesy of the Netherlands National Tou

Veere on the island of Walcheren, once the home of a great fleet of East Indiamen and closely connected with Scotland through the wool trade, will be shut in from the sea within three years by the first instalment of the Delta Plan. Some Zeelanders are opposed to the Plan because they feel that the distinctive charm and traditional culture of their islands will be lost when these are connected by road to the mainland



New and old defences against the sea. Unit caissons are shown (opposite) *being towed into position to stop a gap after the 1953 floods. They weigh 180 tons and are twenty feet high but may be raised by fixing pre-cast sections on top.* (Above) *To lie on the sea-bottom and prevent scouring, willow mattresses are floated into position and then sunk with rocks. This ancient device will be essential since the Delta dams, unlike the Zuiderzee Enclosure Dam, are built on soft sand; although experiments are being made with a nylon substitute*



n Seymour

Part of the scale model of South Holland in the Hydraulic Laboratory at Delft which is being used to help design the Delta Plan and predict its consequences. Water is made to flow up and down to represent tides and also to flow down the rivers to represent freshets. Silt introduced into the water indicates where silting-up or scouring can be expected. Wave-action can also be imitated. The spikes in the beds of the 'rivers' impede the water to make up for the fact that the vertical scale of the model greatly exceeds the horizontal

John S

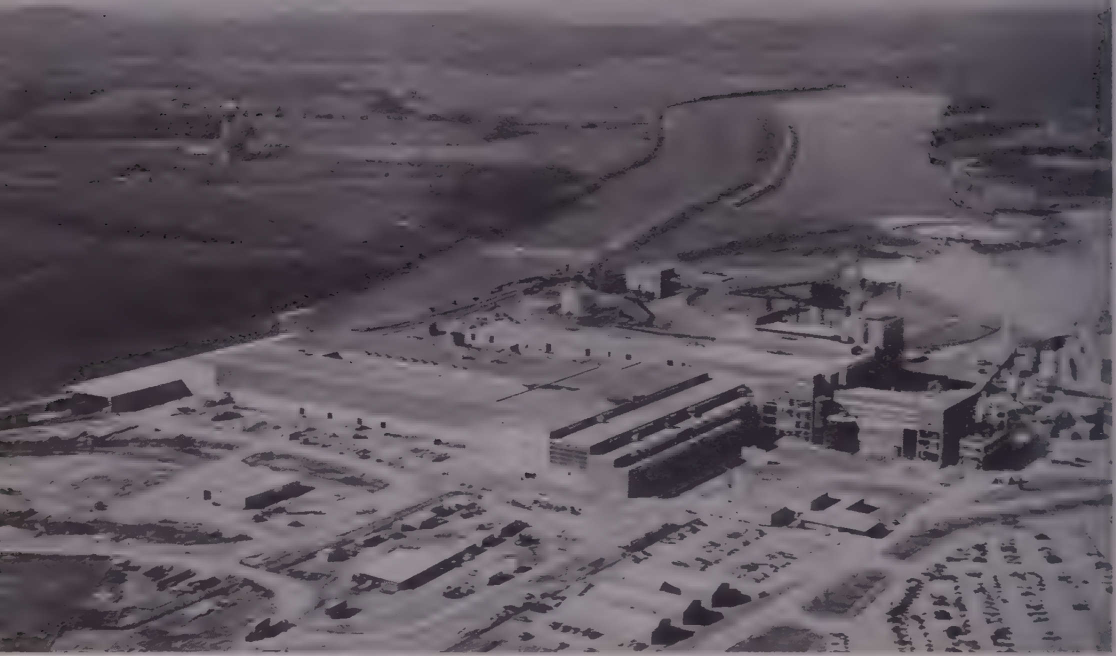
The old windmills of Holland, formerly used to pump the water from land below sea-level, are being replaced by diesel and electric pumps which, being more efficient, extract more water. This has the effect of lowering the land-level and of increasing the salinity of the soil, poisoning crops

a hundred feet of water, is something such as has never before been attempted on this planet. The man who is in charge of the Research Laboratory at Delft, where Holland's water problems are tried out in miniature, said to me: "When I go to the estuaries when a gale is blowing from the north-west and see those enormous waves rolling in from the North Sea I say to myself: 'The thing is impossible!' But when I get back to my office and look at the figures and the results of our research I know that it *is* possible, and that we will do it." It was this scientist who told me that without the struggle to dam the Zuiderzee behind them, the Dutch engineers could never have closed the gaps in Walcheren after the Allies had flooded that island towards the end of the war. Without the experience gained in closing those gaps they could never have closed the far worse gaps after the 1953 floods. And without the experience gained then they could never contemplate carrying out the Delta Plan.

But the Dutch have thousands of years of such cumulative experience and tradition behind them; dating from the time when the first wild Frieslanders threw up mounds of clay on which to crouch during high tides, and on which, according to Pliny: "They resembled miserable ship-wrecked sailors . . . trying to warm their frozen bowels by burning mud, dug up by their hands and dried somewhat in the wind, rather than the sun, which one seldom sees."

From their great hydraulic scientists and engineers, to the heroic *polderjongen* who worked night and day, night and day, to close the gaps after the great floods, they have the very feel of the war against the sea in their blood. Nothing to do with the sea can be certain; but if the coastline of Europe can be altered in the fashion envisaged by the makers of the Delta Plan, it is certain that the Dutch are better qualified to do it than any other people.

Forests for the News
II. Tennessee
by JOHN USBORNE



otographs, except [illegible], by courtesy of the Bowater Organization

(Above) *Bowaters' paper mills in Tennessee: the largest British investment in the U.S. since 1939*

In this and a preceding article Mr Usborne reports on the relationship between a large industrial corporation and two environments in which it operates: Newfoundland and Tennessee. In the former case "controlled regeneration" of primaeval forests by judicious cutting was the keynote of the relationship; here it is the deliberate planting of trees and their treatment as a farmers' crop

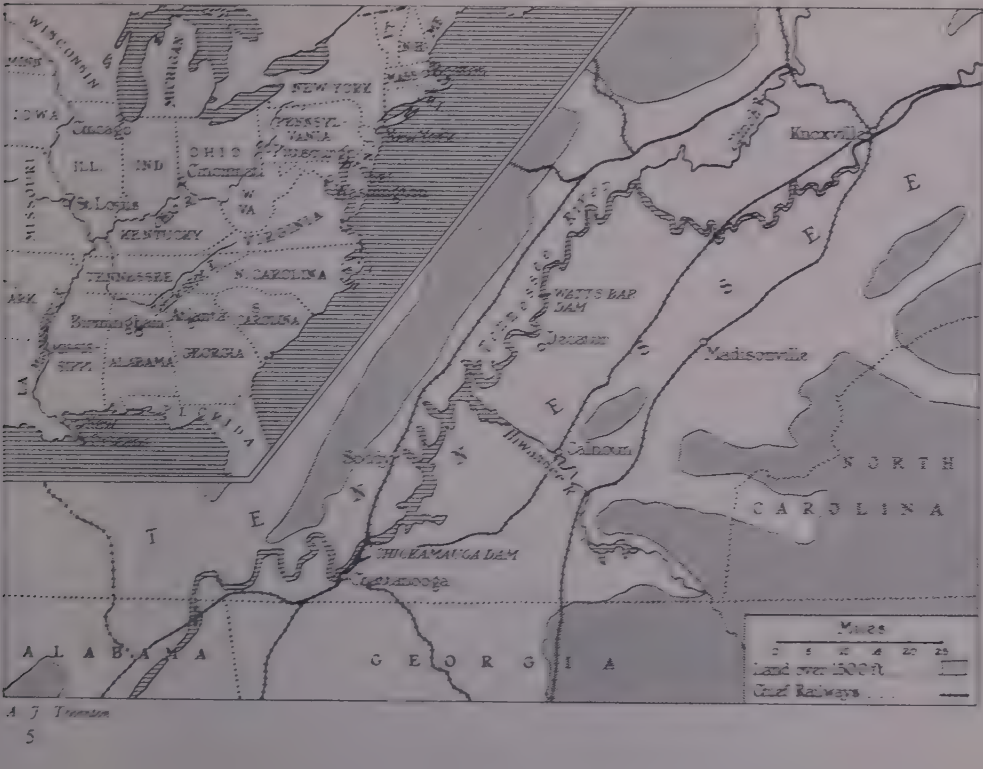
On September 5 of last year I met Luther Robinson with his thirteen-year-old nephew, Gene Melton, in a loblolly pine wood near Decatur, a small settlement in south-eastern Tennessee.

Nineteen years before there were no trees where we stood, but a view uninterrupted except for poverty-grass and rank scrub, of badly eroded farm land, awkwardly rolling and blistering down to a swollen, muddy Tennessee River. Not far from Decatur, Luther, then in his twenties, was helping his father and brothers to scratch away at twenty worn-out acres for field-maize, tobacco and cotton. The family were 'share-croppers' and, as he put it, "after the owner man had took his half-bellyful, there wuzn't but a few ears o' runt-corn for us 'n the doggone mule, no sir." But the worst days of the Great Depression were passing. They'd heard of A.A.A., N.R.A. and a whole alphabet soup of New Deal activity, nearest and clearest of which were T.V.A. and C.C.C. From the Tennessee Valley Authority there were jobs available. Dams and steam plants were going up. There was Watts Bar upstream, and downstream, near Chattanooga, they were beginning on the Chickamauga Dam.

By 1937 the boys of the C.C.C. (Civilian Conservation Corps), an army of officially unemployed, were putting thousands of seedling pines where enough 'dirt' remained to bury their roots. Conservation officers paid the farmers—and Luther was one of them—to rest some land and use artificial manure on other land. Year by year the valley grew greener and the river cleaner and calmer. With war and the forties the country was ready to do its bit to feed a fighting nation and more. "Times was still real tough, yes sir," said Luther, "but we'd never known 'em better. And now", he added, as he picked up his $200 power-saw and signalled to Gene to lend an arm, "now it's time Gene and me took out a coupla trees." The motor started, and within ten seconds a pine, previously marked by a forester of the Hiwassee Land Company, was lying on the tidy floor of the forest. About eight inches in diameter and about thirty-five feet tall, it was soon stripped and cut into five-foot lengths for stacking into cord units, ready to be 'hauled' away to Bowaters' pulp and paper mill at Calhoun, twenty-two miles away on the Hiwassee River. The day before he had cut six cords (one cord equals 128 cubic feet) which was good going considering Bowaters paid $15 a cord, exclusive of the cost of haulage to the mill.

Touring Meigs and McMinn County woods that day with Don Kettenbeil, the assistant district forester, I met several 'producers', as Bowaters call them, and was struck by the contrast between their circumstances and those of the Bowater woodsmen of Nova Scotia and Newfoundland, where I had toured the previous month. In Newfoundland—and to a lesser degree Nova Scotia—until the twenties of this century the tangled forests of fir and spruce matured, rotted and added rich humus for succeeding generations of trees almost unheeded and, as far as newsprint was concerned, quite unneeded. They were 'undeveloped' or 'backward' areas. There was no market and, if there had been, there were no roads. Till the paper mills arrived. Till there was an almost sudden demand from all over for newsprint. It was then a matter, as to a great extent it still is, of cleaning up the forests rather than farming them. Every year ice-storms caused devastation. Later bug-infestation attacked over-mature trees. There was millions of dollars' worth of pulpwood to be cleared before settling down to normal rotation felling and there was, and still is, a shortage of men. They had to be tempted away from the fishing outports, tempted from the United Kingdom by high wages. After thirty years of this, Newfoundland's forests are still overgrown and undercut, and Nova Scotia's but a few degrees nearer to satisfactory control.

T.V.A. and C.C.C. didn't plant the Southern pine in the Tennessee Valley for newsprint. Such an idea was inconceivable because everyone knew that Southern pine couldn't make newsprint. They had only one thought at the time: conservation. At all



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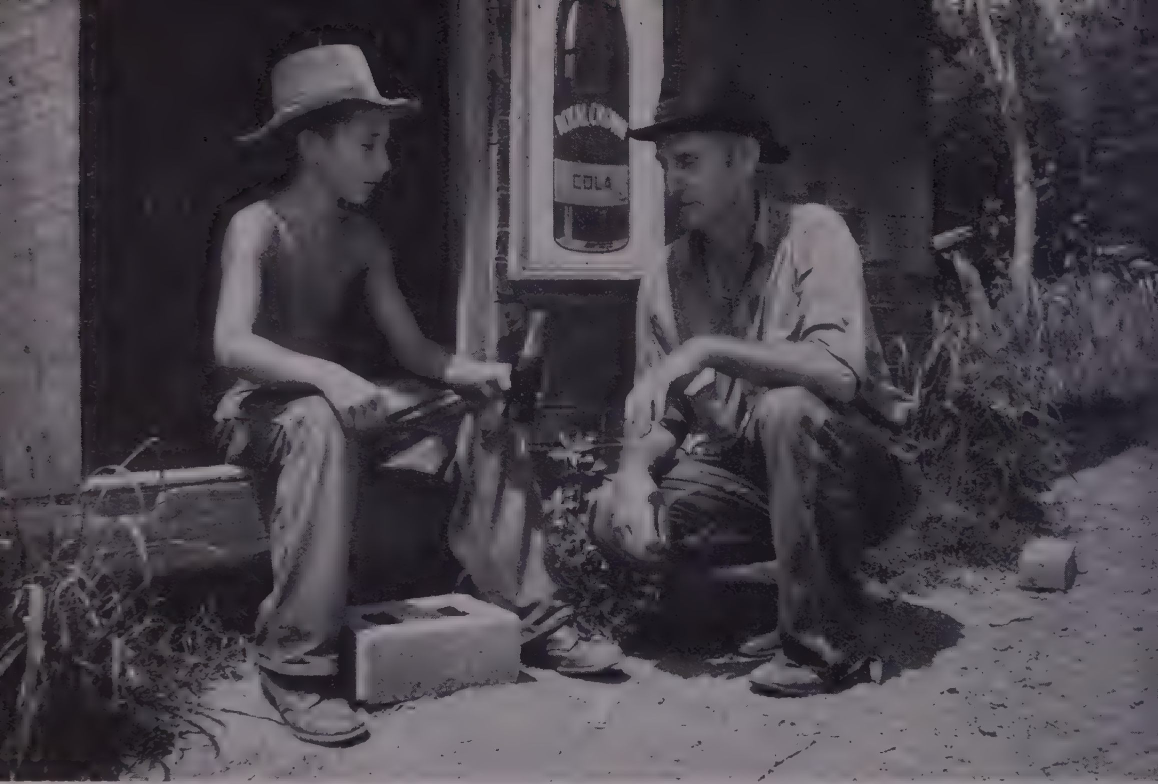


(Above) *During the thirties living-standards in east Tennessee, as elsewhere in the southern States, were low. Eroded farmlands provided only bare subsistence and there was almost no industrial outlet.* (Below) *Now there is an immense improvement due to many factors, chiefly the Tennessee Valley Authority*

John U

T.V.A. changed Jim Henry's life. They taught him soil conservation; they reafforested Calhoun's eroded hillsides; their dams brought the power and water that enabled Bowaters to locate their mills on his farm. (Above) *Southern pine rehabilitating eroded land.* (Below) *Jim Henry beside the Chickamauga Dam*

John U

costs what little soil was left after generations of profligate erosion must be held; the winds must be broken, the rain introduced to leaves and roots instead of skidded into creeks and rivers. If they took root and grew, the pines would be mature in the middle and late fifties—for pit-props and fuel; not much else. Meanwhile, given normal times, men would gradually be drawn off the slowly recovering land and provide labour for the new industries powered by the new dams: General Motors in Birmingham, Du Ponts in Chattanooga, and so on.

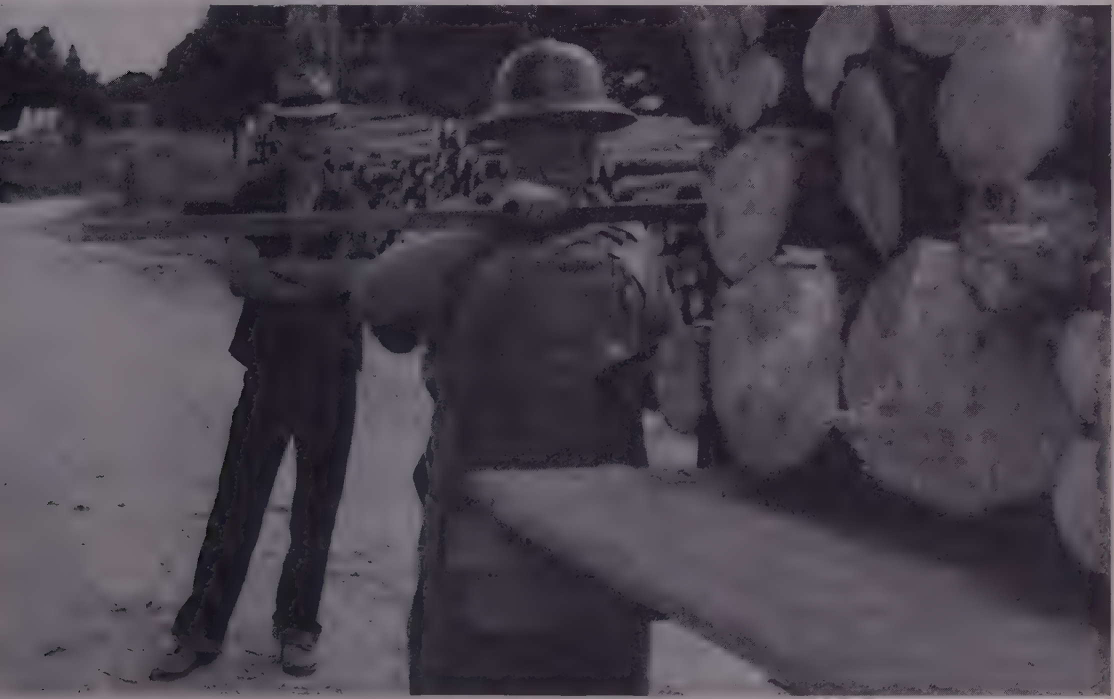
And, but for one windfall of fate, that is roughly what happened, though times, as far as money and living standards were concerned, became better and faster than normal.

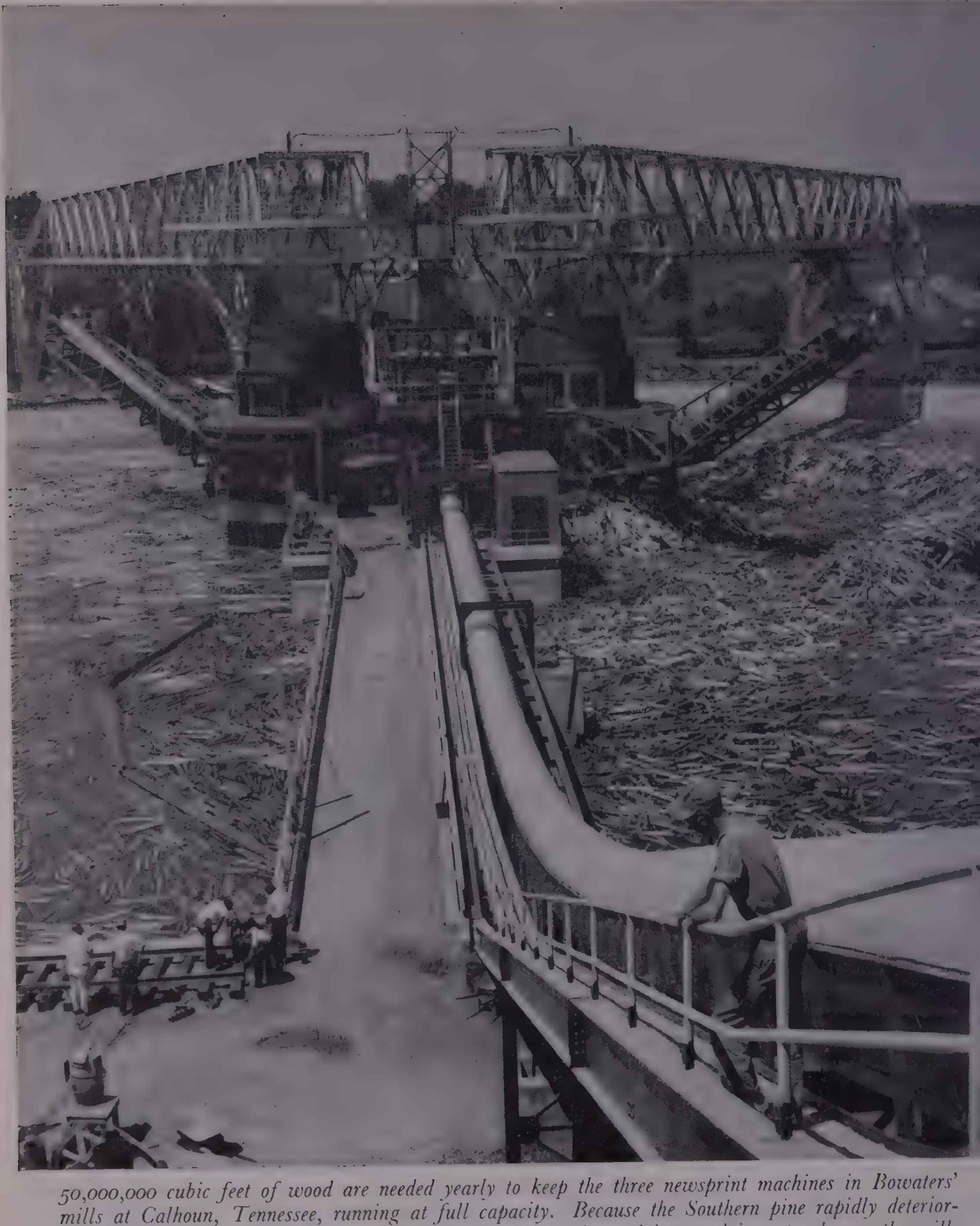
Jim Henry, like Luther Robinson and thousands of hard-working Tennessee farmers who had not been tempted off the land, knew nothing in 1951 of the revolutionary discovery of Dr Charles Herty, a chemist in Georgia. Jim was not interested in trees, though he appreciated their value in conservation. On his 250-acre Hiwassee Farm along the river near Calhoun he was absorbed in the exciting business of rebuilding the Henry status. Descended directly from Patrick Henry, the famous 18th-century American politician and prosperous Virginia Tidewater stock, he inherited a vitality and intelligence well above the average to add to the doggedness that is typical of east Tennessee farmers. Son of a 'row-crop' farmer, he knew poor land when he saw it and determined to do better. In 1920, aged eighteen, he managed to get himself through a short course in Agriculture at a Junior College in Madisonville, Tennessee, where he learned the meaning of rotation, conservation, fertilizers and irrigation. In 1935, when T.V.A. first began advising and helping farmers in his part of the valley, Jim had been farming the Crittenden Farm, 165 acres a few miles east of Calhoun, for six years. 'Authority' conservationists found him a paragon in his readiness to use modern methods, to cut down on row-cropping of cotton, corn and peas and build up the soil with grass for livestock. By 1951, after eleven years on Hiwassee Farm, he was getting $1200 a month for milk and $1000 a year for barn-cured Burley tobacco, and was getting used to T.V.A. men walking round his land.

During the last four years the Tennessee Forest Industries Committee has encouraged nearly 10,000 farmers to treat the fast-growing Southern pine as part of a recognized rotation. Besides resting the land, it pays handsome dividends and indirectly benefits other crops: for example this tobacco

John Usborne

(Above) *Using a power-saw two men can cut about $90 worth of pulpwood a day. These 'producers' can either send their wood direct to the mill and* (below), *after careful 'scaling' in the yard, be paid there ; or they can work through a 'dealer' who receives a commission for delivering it to the mill*





50,000,000 cubic feet of wood are needed yearly to keep the three newsprint machines in Bowaters' mills at Calhoun, Tennessee, running at full capacity. Because the Southern pine rapidly deteriorates after cutting unless it is submerged in water, the pulpwood is stored in a pond near the mills which is large enough to float a 10,000-ton ship. Both the storage pond and the twin pivoted gantry cranes for retrieving the logs are the biggest of their kind in existence. The pond originally held 3,000,000 cubic feet of underwater pulpwood: sufficient to keep the mill running for six weeks, day and night; but with the addition of a third newsprint machine its capacity has now to be increased

For some years before and after they built Chickamauga Dam he had engineers and surveyors and other indefinable "men in good suits", as he describes them, poking about. He left them to it and got on with his farming.

I spent many hours with Jim in Calhoun and driving in the sunshine through the magnificent countryside of east Tennessee and north-west Georgia; and I spent one memorable evening in his new 'ranch-style' house, listening with his pretty young wife, Mildred, to his story. He is a well-built, middle-sized man whose eyes twinkle as he talks in his simple, expressive, musical east Tennessee way; whose hands bang the chair, the table or each other as he recalls the incidents that moved him.

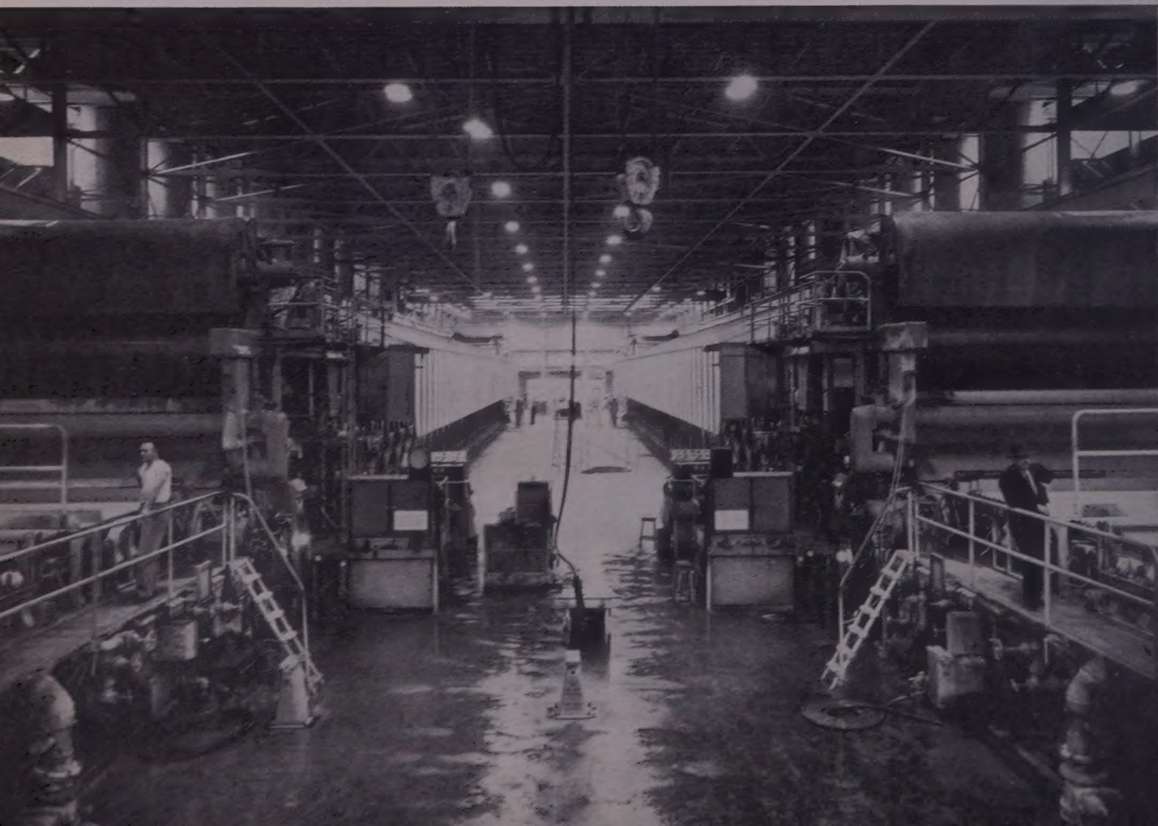
"There was that day in June of '51," he said. "A middle-aged chap in a good suit came up to me as I was looking at my cows. Another chap, I said to myself, from T.V.A. But no, he was a lawyer, and you know something? He wanted an option on my farm; offered good terms. But I said no, sir. I was doing mighty fine, see, and I didn't want to sell. But he came back many times, repeating the offer. What was it all about, I asked him? But he had no mind to tell me except that it was something mighty big and mighty important. I asked him if he was proposing to bring the Greeks or Jews or something to the community, and he said no, it would be a proper English-speaking concern. But he still wouldn't give me the lowdown, no sir. But, though I wouldn't sell, I was getting pretty excited. After one month I signed an option for 180 days. They paid me off on the last day. I got a good price, yes sir, and I was out by July 1, 1952. I was going to buy another farm. But doggone it, there's no getting away from Bowaters. I'm theirs now till they kick me out." (Jim is now an indispensable member of the Industrial Relations Department.)

Bowaters had not exhausted their Canadian forests or their European and American market. The Corner Brook mill's capacity in Newfoundland was not yet at the limit. Bowaters would buy the Mersey Paper Company in Nova Scotia. Demand for newsprint showed little sign of slackening off. The 12,000,000 acres of Tennessee's predominantly Southern pine forests, vastly improved by T.V.A. and the C.C.C., were there almost for the taking and before the end of the war several big men, interested in the production of newsprint, were more than frustrated at the unsuitability of the indigenous pine. There is no doubt that Dr Charles Herty's research work in the 1930s was accelerated by this frustration. It was a chemical triumph that surprised everyone, not least Sir Eric Bowater and his advisers in London and New York. But what surprised everyone more, especially his rivals in the United States, was the genius employed by Sir Eric and his team in choosing the mill-site, negotiating with the Defense Production Administration of the U.S. Federal Government for the vital Certificate of Necessity, and rapidly building the $60,000,000 concern. As a high Bowater executive of American nationality said to me with more pride than shame: "A goddamned Limey outsmarted the lot of us."

The site was chosen for many good reasons. At first some doubt was felt as to whether in the immediate neighbourhood of the Tennessee Valley, northern Georgia and northern Alabama, enough pulpwood could be procured to satisfy the 300,000-cord annual requirements of the proposed mill, without (as A. B. Meyer, president of the New York subsidiary of the Bowater Paper Corporation put it in a letter to the chairman of the T.V.A. board of directors) "overcutting these forest areas and without interfering with the pulpwood supplies of mills that are already established and draw pulpwood from these same areas." But here one of the great contrasts with Nova Scotia and Newfoundland is relevant. Southern pine matures in twenty-five years as against the seventy-five years required by the northern firs and spruces. Bowater experts were satisfied that this factor made the position secure indefinitely.

It was estimated that the new plant would need 25,000,000 gallons of water a day. More than this was readily available from the nearby Hiwassee River. T.V.A. power was available beyond the amount needed. The mill would need a big supply of natural gas. The transmission pipeline of the East Tennessee Natural Gas Company ran through the property. Cheap transportation was available at the doorstep on a waterway of 630 miles of river from the Hiwassee to the Tennessee to the Ohio to the Mississippi. Calhoun is on U.S. Highway 11, which connects Knoxville with Chattanooga. Markets in the southern States would be easily accessible. What luxury, I thought many times, compared with Corner Brook in Newfoundland, where the winter is ruthless and long, the summer wet and short, the roads few and indifferent, the rivers, when running, chiefly unnavigable and precipitous, and the markets remote. But there is one snag, and it may serve to comfort northern Bowater men and draw the old moral that one cannot have

(Left *and* below) *The pulpwood and the necessary chemical ingredients go in at one end of a low, beautifully planned building about 440 yards long and covering six acres; and the finished products, at the rate of 1,000 tons a day, emerge at the other end on the shipping platform. Of the 750 employees in this highly complex and efficient technical installation only about 250 are from outside the immediate neighbourhood in east Tennessee.* (Opposite, top) *What strikes a visiting Englishman most about the luxurious cafeteria of Bowaters' Tennessee pulp mill is the sight of Labour and Management eating together on friendly terms; many problems that may exist between them are ironed out over a meal.* (Opposite, bottom) *A good proof of the new prosperity that Bowaters have brought to the Calhoun region is the fact that the car-park for employees covers 300,000 square feet and most of it is occupied*



one's cake and eat it, if I wrap it up in a number of personal experiences to conclude this article.

The gigantic log-pond attached to the Calhoun mill was so loaded when I saw it in September that it was impossible to see any water. It was pointed out to me that the Southern pine had to be submerged in water within a few days of cutting or it was devoured by worms. That explains, I realized, why I can see none of the mountainous log-piles which were so much a part of the mill landscape in Nova Scotia and Newfoundland. Up there, for two or three months of the paralysing winter, it is vital to have a store of logs to draw on and good to know that, while these mountains are being lowered, there are companies of men in the woods sliding logs onto the ice of the lakes and rivers against the time when the thaw will send them hurtling down on their long journey to the mill. No gnawing worms for them.

And yet here in Calhoun, Tennessee, the twin-booms which handle this untidy overflow of pine-logs are the biggest in the world and the pond the most capacious. It explains a lot of things, I mused. Bowaters in Tennessee, I learned after a few days, is an example to an industrial civilization of how efficient exploitation of natural resources can and must lead to an all-round improvement rather than deterioration of the geographical balance in which man is included. Spurred, in the last analysis, by the profit motive, they have assured themselves of an annual supply of pulpwood from their own immediate neighhourhood. They have in four years already planted nearly 40,000,000 pine-trees. They have, through the Tennessee Forest Industries Committee, encouraged nearly 10,000 farmers to treat the pine as a crop in a recognized rotation system. They have organized a decentralized distribution and marketing system. They are financing the woods at the rate of about $3000 an acre.

I cast my mind back to Luther Robinson in that loblolly wood near Decatur. He could cut $90 worth of wood on a dry day in a good wood, about what twenty years before he could earn in one year. With some of this he bought fertilizers to increase his corn and tobacco crops and improve his pastures. And yet he was uneasy that Bowaters would not take more than two days' cut in a week from him and irritable with Don Kettenbeil's excuse that the capacious log-pond at the mill was bursting at the seams, and additional consuming plant would not be ready for a while. "But heck, Don," Luther had exclaimed, "there ain't enough newsprint in the world, and these here trees need cuttin', and you need the dough and I need the dough. Heck, Don . . ."

And I remember my first Sunday in those parts. Jim Henry had driven me in his new Buick round south-eastern Tennessee. We crossed the Tennessee River by the magnificent Chickamauga Dam north of Chattanooga and headed north to a small community called Soddy on an arm of the river. Here, in a clearing by the water, were 300-400 cords of pulpwood neatly stacked, waiting for Monday when men would begin loading them into barges. Some of the wood had arrived at the landing-stage on Thursday; none of it would reach the mill before Tuesday evening. It was a beautiful afternoon. Huge butterflies flapped about the alleys between the logs and a mocking-bird flew nervously from bush to bush, giving a fair imitation of an English blackbird's song. Another bird, it seemed, was singing, which I could not identify or even locate. It was hard to say where its low rasping warble was coming from, because whenever I moved near to the sound, it stopped and started somewhere behind me. I kept absolutely still for about two minutes. The sound began just a foot from where I was sitting on a pulpwood log. (Jim, by the way, was sitting in a barge sun-basking.) When I realized that the sound came from worms gnawing at the wood, I put away my field-glasses and pondered the remark of the guide who had first shown me the overcrowded log-pond: "The only fly in the ointment down here", he had said, "is the worm in the pulpwood." It is a sobering thought that for all the amazing ingenuity, skill, foresight, expense and generosity manifested by so many industrious human beings, in sitting back to regard their handiwork they can hear the worm gnawing at the very essence of their vitality.

Bowaters are now trying to kill the worm and other insects which damage the forest, by spraying the woods from helicopters with special chemicals; and, mind you, in Calhoun they are producing now at the rate of 300,000 tons of newsprint a year. The whole enterprise is a triumph of Anglo-American collaboration, a symbol of Atlantic solidarity, a prelude to greater triumphs ahead. But listen to that worm.

Jim Henry's reaction, however, was different and no less philosophical. "We only hear that critter on Sundays," he said. "Weekdays, doggone it, there's too much noise of men and machines. But the little devil's always drowned in the end . . . and always will be, God be praised."